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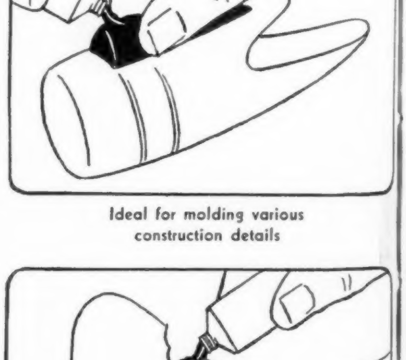

Tops for general repairing of rough spots in wood

TESTOR CHEMICAL COMPANY
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By BILL WINTER

FOR the first time in well over twenty years of model building, the Scrap Box is puzzled by current trends in the activity. Things are changing again—there are many signs of important trends. But what do these signs add up to?

First, there was the development of team racing by the F.A.S.T. groups of California and this idea, with various local alterations, is catching on at least temporarily in many sections of the country. Then, there is the trend to precision in free flight, with various type contests being tried on the coast. Now, Jim Walker has come through with a report on one of the most unusual free flight meets ever engineered; a contest in which tiny *Infant*-powered models battled it out with eight-foot giants. Then there is the increasing interest in small engines. The *Infant* was only the first. Mel Anderson's *Baby Spitfire* is awaited with interest everywhere. Coast correspondents keep mentioning that at least two producers will jump into this field with all four feet—and in the East, we note the *"O.K." Cub* is ready to go.

It isn't that contests and contest rules have failed us; it seems to be a universal expression of a demand for more everyday fun out of models, for more sport, more ingenuity. Once we trekked to distant contests to compete as individuals with fellow modelers, but the expansion of clubs, both in numbers and in membership, seems to be changing the picture. The conflict of many interests in clubs may be teaching we specialists (and we all *do* specialize in one kind of model or another) to respect the other fellow's brand of flying. To fly and compete together on a more local level, new compromises must be worked out, new kinds of contests arranged so the boys can get together and have some fun—all the boys, not just a few.

Variations of this trend are many and novel. The *Lakewood Club*, another California outfit, has been running a series of small-engine club contests for both free flight and controline. With so many experts on the roster, this group is unusually capable in all branches of modeling. As mentioned in an earlier column, Don Newberger won their first free flight contest. With long experience, such veteran modelers can compete on any basis, but it is different with most of us. Clubs have split over free flight and controline arguments. Club contests for one kind of model frequently have a handful of members competing while the others remain on the sidelines. That this problem could be solved seems unlikely; or perhaps we should have said seemed, not seems.

From Phillip A. Mercier, Jr., secretary of the *Nashua Cloud Chasers*, 183 Main Street, Nashua, N.H., the *Scrap Box* learns of a singularly ingenious scheme to be tried by this club. (Frankly, it is nice to learn that the East can shoulder a little of this pioneering job!)

"This is an attempt to encourage 100% participation in our club contests," says Mercier. "Formerly, each member worked on his own 'long suit,' leaving other phases of the activity to the other fellows. That would be fine in a large club, but such a split in a small outfit like ours, means that only two or three members would compete in any given event. So, we have put aside many things, joining hands for the good of all, we hope.

"We plan to run one long contest for the entire season, comprising six separate events. The models entered are limited to 1" scale, exact. The engines are restricted to .30 displacement maximum. Any type of aircraft is permitted, all contestants may draw their own plans, or purchase same, provided they are accurate. These plans are submitted to a Plans Ruling Board who says either 'Okay' or 'No-Kay,' depending on accuracy. The contestant then builds his model using any or all controls found on the full size airplane, plus provision for carrying weights internally or externally.

"The following events are planned:

1. Beauty — Workmanship and Detail;

(*Turn to page* 5)

B. L. J. Neal of the *Sudbury Heights Model Aero Club*, (73 Eastmead Ave., Greenford, Middlesex, England) sends this picture of his organization. They build many kinds of models and would like to correspond with American builders of any type model except controline

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Serving Aviation 20 Years

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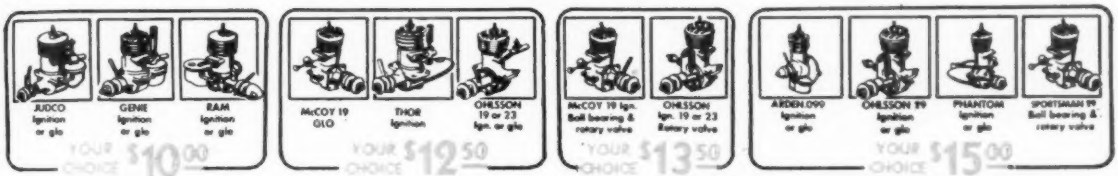

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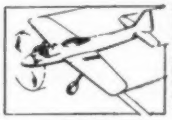

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with OHLSSON ENGINE

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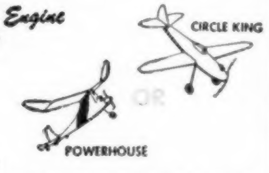
Scoop! *Complete O.K.* CUB FLYING OUTFIT only $7.95

The brand new Herkimer O.K. Cub Engine. It's the latest in pint-sized glo engines, with only .049 cubic inch displacement! The engine is tiny but develops over 8 ounces of static thrust at 15,000 rpm, yet weighs only 1½ ounces. A rotary valve engine that's a "snap to start".

Engine



Planes

Your own choice of the Circle King U-Control Kit by Scientific (30" span, a simple job to build and fly) complete with parts for mounting the Cub Engine OR the new Cub Powerhouse by Berkeley (33" span version of the same Powerhouse that has won so many larger gas contests and held the CO2 record). Either kit can be assembled and flown by modelers with little previous experience.

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Scrap Box

(Continued from page 1)

model must be flown on the day of this event.

2. High Speed—Fastest of three flights.
3. Low Speed—Slowest of three flights.
4. Payload—Heaviest additional weight, computed by power loading, three tries.
5. Measured Fuel—Total distance flown on contestant's fuel mixture, same amount to all, regardless of engine or model size.
6. Stunt and precision.

"A special 'die-hards event' will be arranged for contestants who have damaged their models, missing chances at some of the above events. Score does not add to total score but goes toward consolation prize. Engines may be changed for various events, both glow and spark ignition may be used. Props may be changed, as well as fuel, batteries, and line lengths. Two or more models may be entered by each contestant but scores are kept separate. Each event has a first and second prize, and there will be a grand award.

"Perhaps such a contest is not practical, maybe it cannot prove popular, but we aim to find out and will know next fall from the number of satisfied contestants. Theoretically, success would depend on picking a good all-round airplane, choosing a reliable engine, and maintaining both in top notch condition. The other factors, props, fuel, wire length and diameter, must be considered but eventually everyone will arrive at a satisfactory compromise.

"Perhaps we won't solve any problems besetting modelers in other localities, but we feel sure that our summer's flying is going to prove more fun than ever before. After all, isn't that what we are looking for?"

Before bringing you Jim Walker's report on his first "Flight Plan Contest," take a quick look-see at the rules, listed on page 27 of our May '49 issue.

"The success of the first contest far exceeded our expectations because of the beautiful flying and close scoring," Jim tells us. Whereas 200 pts. was considered the probable maximum, good weather permitted eleven entrants to beat 184 pts. In winning first place with 302 pts., Owen Brown filed two left circles and two right circles, which he performed exactly. He filed within 4 sec. of his duration and landed within 64' of the chosen spot.

"Richard Nichol took second place with 300 pts., losing out when his ship reversed the turn after one left circle, not two as planned. He flew a standard free flight model rigged for sharp right glide circles. Terry Crane took third on a ground skimming flight with an *Infant* model spanning 20". He rigged for a maximum number of circles. A large contest model won fourth, and sixth was battled for by an *8' free flighter* and a *22" Infant* job."

Until they got the hang of the thing, many contestants ran up minus scores on their first flights. The trick is to know the flight habits and paths of the ship as learned on test flights, then to file a plan. Brown moved his landing marker to the actual landing spot found on a trial flight. Due to ground conditions, hand launching was permitted; but in the future it is planned to give the flier his choice, since ROG take-off runs up points but destroys accuracy of timing. In many cases a contestant runs up a high score, looking like a sure winner, until his model lands outside of the 500' limit from the spot, or else hooks a thermal. Both conditions are drawbacks to filing an overly ambitious flight plan.

"This type of contest will have a strong appeal for those who have flood-lighted areas available," continues Jim. "With special inefficient propellers, the whole flight can be held down to a maximum altitude of 20' and, due to the calm which is usual at night time, the area need not be larger than a regular baseball or football field.

"I have put a good many years' thought into this particular contest, ever since my first experience with gas models. I well remember early flights that were realistic in nature, but I soon lost interest after building a few contest type free flight jobs."

See what we mean, men? So much is cooking—so many new ideas. There are many times when existing categories of models and of flying leave much to be desired. But, while we favor changes, evolution, and kid ourselves that we are progressive, the *Scrap Box* feels a wee bit uncertain about it all. For example . . .

This Team Racing idea is spectacular, exciting, might be a real shot in the arm to controline, but suppose it proves a little too elaborate for the average small group. Wouldn't it be a shame then if the semi-scale or scale racer missed the boat? In the *Scrap Box's* opinion, it is the kind of model involved that will hold the greatest attraction to the average Joe. We are for Team Racing—in fact, were named to a committee on rules—but we are more for the semi-scale airplane. These cute ships have everything. They can be raced, flown like speed, they satisfy the urge for realism, they are much safer than unrestricted speed models from which the unimaginative few gladly would eliminate the wings—if they could figure out how to do it.

This Flight Plan scheme of Walker's may prove the biggest thing in free flight in many a moon. Who knows? What will happen to the Flight Plan idea if it catches on, is tried in many sections, is modified and changed with experience in many hands? It seems to us that in this period of feeling our way it would be sound thinking to delay any hurried judgment on rules, at least where they determine the official status of a new event to be included in major contests, be they variations of precision in free flight on the West coast, of rounded-out all-inclusive performance in controline in New Hampshire, the Pan

(Turn to page 58)

IT'S ONLY THE beginning for the B-36! The world's largest landplane (exceeded in size and weight only by Howard Hughes' monster flying boat) has progressed in one short year from a plane whose production contract cancellation had actually been written, to the No. 1 strategic weapon of the United States! The huge bomber has completed a 9600-mile non-stop flight (during the course of which it dropped a 10,000-lb. bomb load), has dropped TWO 42,000-lb. bombs in a single flight, has reached 46,000 ft. altitude and has remained above 40,000 ft. for 12 hr. But this is "only the beginning," according to the Air Force, which plans development of the giant into a 500 mph, 50,000-ft. bomber!

FIRST STEP in this new program is the addition of four turbojet engines to the six Pratt & Whitney *Wasp Major* engines already installed. These engines, slung in pairs under each outboard wing panel, will: (1) get a larger load off the ground in the same distance; (2) get the same load off in a shorter distance; (3) get a larger load up to cruising altitude in the same time; (4) get the same load up to cruising altitude faster; (5) increase the top speed of the bomber for its run over the target; or (6) permit a larger load to be carried at the same top speed over the target. That sounds mighty impressive but there *are* some drawbacks, such as the greatly increased fuel consumption which will cut down the plane's range, inefficiency of the jet engines operating at the comparatively slow (400 mph) speed of the B-36 since the turbojet doesn't become efficient until the airplane exceeds about 550 mph.

ADDITIONAL STEPS now slated for the B-36 include the addition of sweepback to the outer wing panels to raise the critical Mach number (at which really high drag begins), strengthening of the wing spars to increase the maximum gross weight of the plane to 358,000 lbs., and a study of turbo-prop engines to reduce the fuel consumption and add even more power for take-off. An additional 39 of the big bombers has recently been ordered, making a total of 134 to be built, of which about 50 have been completed.

NAVY WILL ATTACK the world's speed record any day now and may have rung up a new high mark of more than 700 mph by the time you read this. The plane: Vought XF7U-1 *Cutlass*. Then, the Douglas D-558-II *Skyrocket*, the world's fastest aircraft, will be "let out" for the absolute record. Although the Air Force Bell X-1 has done 1000 mph (think of it!), Air Force didn't claim a world's record because that would have required publication of the official actual speed attained and the Air Force wants that kept a secret, although they have done everything but endorse the figure of 1000 mph! Official record on the books is the 670.981 mph of the swept-wing North American F-86A and that is the mark

(Turn to page 59)

(Above) Republic XF-91, a high altitude interceptor recently unveiled, has rocket and jet power. (Below) Tiny Northrop X-4 is only 20' long. Despite rakish appearance, it will be used for subsonic research

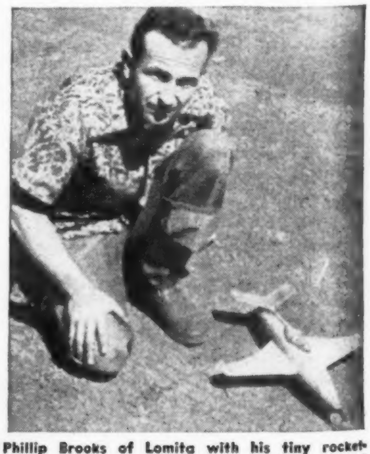
REPORT FROM THE WEST

by Lew Mahieu

YOU probably have heard about the *Thermal Thumbers* Sport Contest, but right here we would like to let everyone know what a swell deal this type of contest is. Jack Haines, a member of the *Hawthorne Modelers*, brought out his five year old *Buccaneer* powered by a Cobra engine, and walked off with a beautiful 18" trophy and a *McCoy* engine for winning first place. Of course, Jack knows his modeling, but this should prove that any style of gassie will work in these contests. The point of the contest is to make three flights total 4:30. The engine run has to be more than 20 but less than 30 sec. Why don't some of you fellows in other parts of the country give it a try? Oh yes, Jack's time in the March 20 contest was 4:30.9.

You have probably noticed on some entry blanks the two little words that say "Rain Date"; well we are going to admit that there was one contest that had to be postponed for over a year. (In California, too!) The *L.A.A.M.* Inter-Wing Free Flight Gas Contest was postponed six times! The contest was first scheduled for February 12, 1948, and was postponed because of - - - -. Every time the contest was scheduled, it had to be called off again because of - - - -. Finally it happened—March 27, 1949 the meet was run off. For this contest only, the classes were combined. A & B was won by Bob Degand of the *Thermal Thumbers*. C & D was taken by that hot Jr., Daryl Sheperd, also from the *Thermal Thumbers*. The high point club of the meet was the *Inglewood Flight Masters*. Inter-Wing contests are one of the many advantages of a club belonging to the *L.A.A.M.* In addition to the permanent trophies, there is a large perpetual trophy that goes to the high point club of the meet. At the end of each cycle (a series of four meets) the club with the most points retains the 4' Trophy until the end of the next cycle.

You will probably be interested to know that the Air-O-Model Company is now manufacturing a swell line of kits. Besides the *Small Fry* and other Infant size airplanes, Air-O is producing current A.M.A. record holders like the "Hawk" class "D" towline glider and the



Phillip Brooks of Lomita with his tiny rocket-powered U-control job. He is building special engine for it

Lew Mahieu (left) and Ace Boultinghouse examine a pair of *Baby Spitfire*-powered planes. Ace is a tool designer and right-hand man for Mel Anderson

Zeek A & B free flight gas job. There has been a large response from modelers all over the country for these and other West Coast designs which will be available soon.

We received news from Seattle, Wash., through Carl Stokes, that there is a new club there called the *R.P.M.'s*, with a membership of fifteen. They have a lot of club activities planned, so their little organization should be a big success. Good Luck fellows.

Guess who we saw at Western and Rosecrans March 20 — Johnny Davis! Johnny was running a *McCoy .19 Thimble Drome* car. He said that this was about the extent of his modeling at the present time.

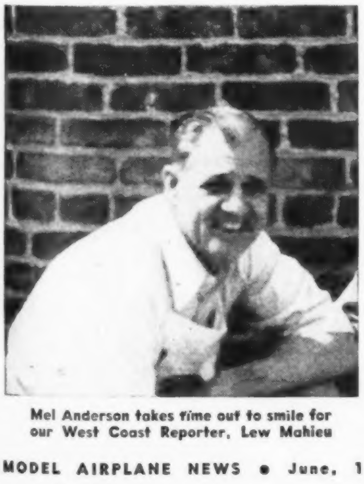
Last month we announced the All Free Flight Contest at Artesia, California, May 7 and 8. PLEASE NOTE—the date of this great event has been changed to June 4 and 5. Don't miss it, it's to be the biggest meet on the West Coast in 1949.

That glider thrower (or should we say Bob Degand) has done it again. At a recent indoor record trial, Bob did an official 1:13 flight. In view of this indoor "B" hand launch record, we will have to borrow Bob's design — *Lucy* — and start throwing our arms off, up to our shoulders!

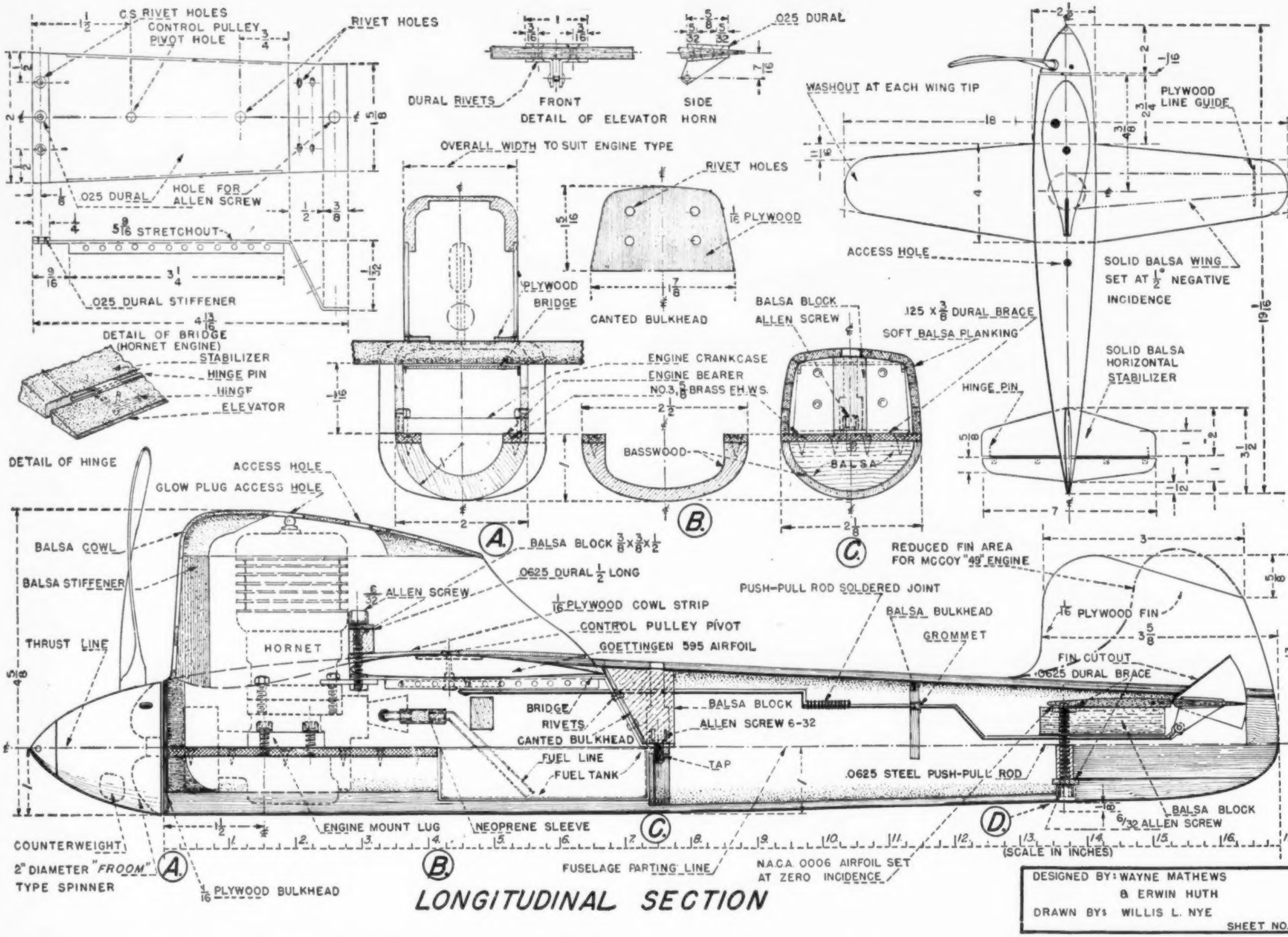
* *

We want to thank that very genial gentleman, Mel Anderson, for giving us the privilege of introducing his new gem of precision, that little rascal, *Baby Spitfire*. Mel and his associates experimented for almost a year on the size of this little engine before arriving at the .045 displace-

(*Turn to page* 57)



Mel Anderson takes time out to smile for our West Coast Reporter, Lew Mahieu


C.S. RIVET HOLES
CONTROL PULLEY PIVOT HOLE
RIVET HOLES
.025 DURAL
HOLE FOR ALLEN SCREW
5 9/16 STRETCHOUT
.025 DURAL STIFFENER
DETAIL OF BRIDGE (HORNET ENGINE)
STABILIZER
HINGE PIN
HINGE
ELEVATOR
DETAIL OF HINGE
DURAL RIVETS
FRONT
SIDE
DETAIL OF ELEVATOR HORN
.025 DURAL
OVERALL WIDTH TO SUIT ENGINE TYPE
PLYWOOD BRIDGE
RIVET HOLES
1/16 PLYWOOD
CANTED BULKHEAD
ENGINE CRANKCASE
ENGINE BEARER
NO.3, 5/8 BRASS F.H.W.S.
BASSWOOD
BALSA BLOCK
ALLEN SCREW
.125 x 3/8 DURAL BRACE
SOFT BALSA PLANKING
BALSA
A.
B.
C.
WASHOUT AT EACH WING TIP
PLYWOOD LINE GUIDE
ACCESS HOLE
SOLID BALSA WING SET AT 1/2° NEGATIVE INCIDENCE
SOLID BALSA HORIZONTAL STABILIZER
HINGE PIN
REDUCED FIN AREA FOR MCCOY "49" ENGINE
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GLOW PLUG ACCESS HOLE
BALSA COWL
BALSA STIFFENER
THRUST LINE
HORNET
BALSA BLOCK 3/8 x 3/8 x 1/2
.0625 DURAL 1/2 LONG
6/32 ALLEN SCREW
1/16 PLYWOOD COWL STRIP
CONTROL PULLEY PIVOT
GOETTINGEN 595 AIRFOIL
PUSH-PULL ROD SOLDERED JOINT
BALSA BULKHEAD
GROMMET
1/16 PLYWOOD FIN
FIN CUTOUT
.0625 DURAL BRACE
BRIDGE
RIVETS
CANTED BULKHEAD
BALSA BLOCK
ALLEN SCREW 6-32
FUEL LINE
FUEL TANK
TAP
.0625 STEEL PUSH-PULL ROD
BALSA BLOCK
6/32 ALLEN SCREW
ENGINE MOUNT LUG
NEOPRENE SLEEVE
D.
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2" DIAMETER "FROOM" TYPE SPINNER
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FUSELAGE PARTING LINE
N.A.C.A. 0006 AIRFOIL SET AT ZERO INCIDENCE
LONGITUDINAL SECTION
DESIGNED BY: WAYNE MATHEWS & ERWIN HUTH
DRAWN BY: WILLIS L. NYE
SHEET NO. 1.

Wayne Mathews at left holds *Hornet*-powered ship, while Irwin Huth shows the McCoy 49 version

Speed Trainers

by Willis L. Nye

GENERAL. The development and the construction of these high speed basic trainers represents approximately three months of engineering prior to the assembly work. These models were constructed for competition in the Class C and Class D categories and also for use as high speed basic trainers for future competition. The trainers performed in a commendable way and established records in competition. A *Hornet* or *McCoy* engine may be used as desired. The original Class D ship carried a *Hornet*, while a *McCoy 49* powered the C job.

AERODYNAMIC DESIGN. The wing configuration is shown on Sheet No. 1. It is conventional in all respects and has a tapered constant airfoil section. A Goettingen 595 airfoil was selected and exhibits excellent stability and lift characteristics. At high speed, stability about the lateral and the vertical axis is of major concern. The wing is set at a negative 1/2° angle of incidence. Each wing tip is washed out, and the projected wing area is 46 sq. in.

The tail plane is symmetrical and is an N.A.C.A. 0006 airfoil. It is set at 0° angle of incidence.

The fuselage is tapered in planform and cross section; no fillets are installed at the wing-fuselage attaching points.

Construction of only one model is described, except for the few points of difference between the two; these points are detailed in text and plans.

STRUCTURAL DETAILS. The fuselage is made in two halves, the dividing or parting line being coincidental with the thrust line of the airplane. The lower half is carved and hollowed from straight grained basswood for high strength to weight ratio. Basswood is stronger though somewhat heavier than balsa. The monocoque construction accommodates the engine installation and the fuel tank. The strength and the form is maintained solely by the basswood shell. The wall thickness of the shell is thinned toward the empennage. Dural plates and balsa blocks are used at the engine installation to provide additional strength against the high speed landing loads.

The upper part of the fuselage is constructed of 1/8" balsa planks attached to bulkheads as shown on the drawings to maintain the form. Balsa planking is stronger than a balsa shell in this respect. The fuselage halves are joined by 6-32 Allen head steel screws. By means of these socket head screws, it is possible to join the halves securely together by use of a hexagon rod wrench inserted into a suitable handle. The shank of the wrench should be of sufficient length. The screws fit into tapped holes in the duralumin crossbraces and the bridge structure.

The wing is made of solid hard straight grained balsa, and is carved and sanded to the desired airfoil. It is made in one piece. The wing, the upper half of the fuselage, and the tail surfaces are all covered with *silkspan* which contributes additional strength to the entire structure.

The bridge structure is made of dural formed to the dimensions shown on the drawings. The bridge varies in the basic width dimension for each model. It is flanged and provided with drilled lightening holes to reduce weight. Each type engine presents different installational requirements and different mounting lugs must be used for the various engines. As the prospective builder can see, the function of the bridge section is to form a central structure to which the fuselage, engine, and wing assemble. The bridge is stiffened by providing sufficient thickness of metal for the countersunk rivets and tapped holes for the attaching screws.

For convenience, the bridge and the engine installation should be so constructed that the engine mounting lug is formed correctly. Accuracy in dimensions should be maintained so that no holes require "drifting" to achieve a satisfactory fit. Note that the *McCoy* engine requires

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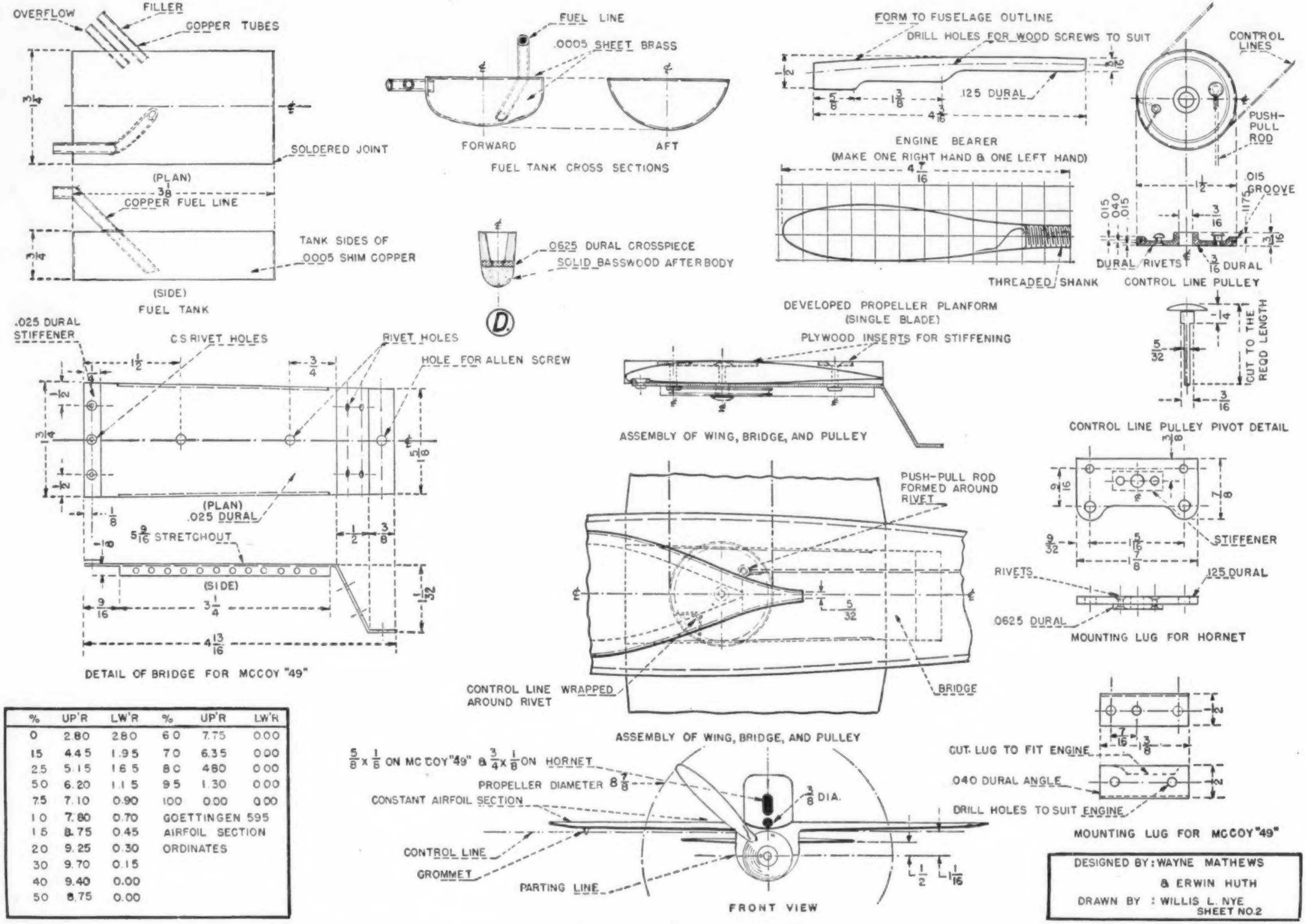


%	UP'R	LW'R	%	UP'R	LW'R
0	2.80	2.80	60	7.75	0.00
1.5	4.45	1.95	70	6.35	0.00
2.5	5.15	1.65	80	4.80	0.00
5.0	6.20	1.15	95	1.30	0.00
7.5	7.10	0.90	100	0.00	0.00
10	7.80	0.70	GOETTINGEN 595		
15	8.75	0.45	AIRFOIL SECTION		
20	9.25	0.30	ORDINATES		
30	9.70	0.15			
40	9.40	0.00			
50	8.75	0.00			

Lt.Comdr. Tex Witherspoon, Contest Promotion Mgr.

Bill Sparks, Mid-States Prexy, Chief Timer

Lloyd Cooke will be Field Manager this year

Olathe Revisited

Leo Rutledge, Director for Rubber and Gliders

Jean Seale will direct Free Flight Gas

June Pierce will have his hands full with R.C.

by C. O. Wright

TWELVE hundred modelers at the final award session at last year's Nationals voted the Olathe contest so outstandingly successful and the hospitality so complete that all wanted to return to the heart of America for the Eighteenth annual classic. So it is to be the Naval Air Base at Olathe, Kansas, again for this year's Nationals on July 26 to 31.

Back in August '48, the sponsors were not so sure they wanted a return engagement, for the Olathe Leaders, Dale Dorst, Tom Poor, Jess Hall, and all the rest were bleary-eyed with loss of sleep and were fatigued to the bone. Only as the months advanced were the blisters and sunburn forgotten, and they replied to the resounding applause with another invitation to the AMA Contest Board.

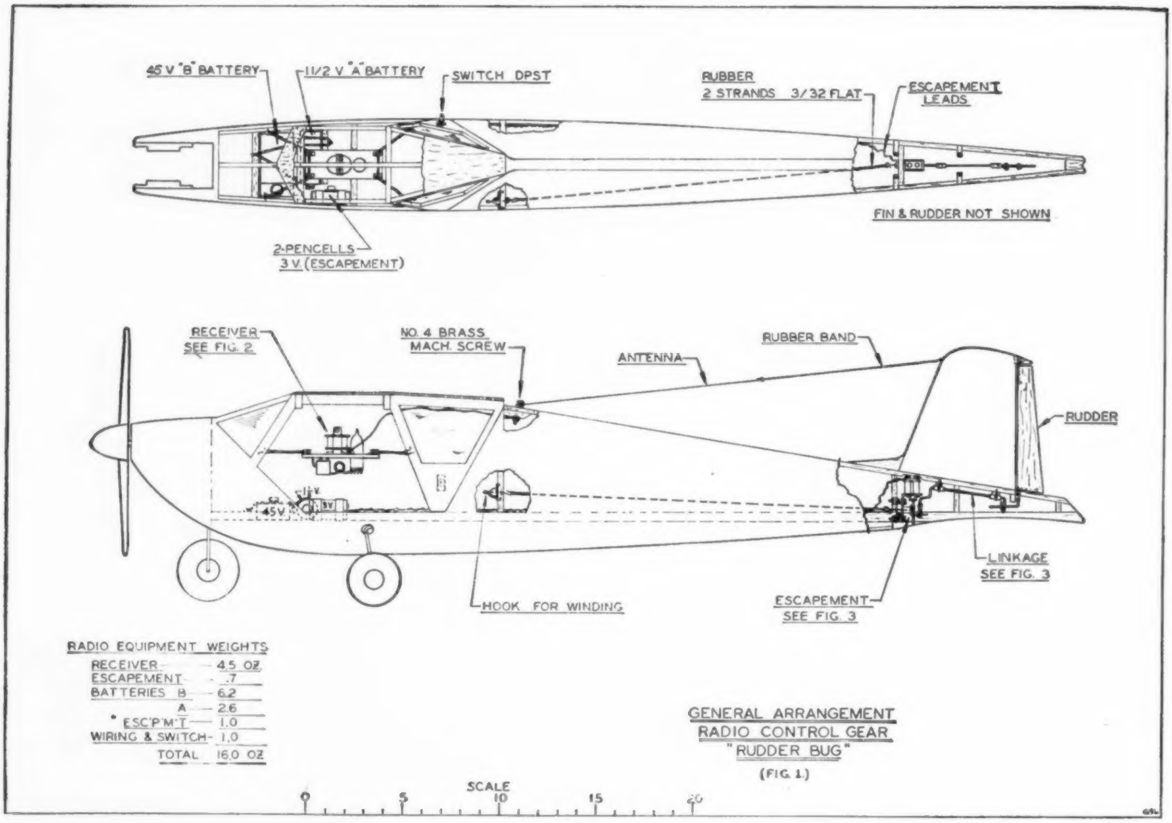
THE THREE HORSEMEN AGAIN AT HELM. The same three big brass are again in charge with the lead man shifted to Jess Hall, truck fleet owner. Dale Dorst, implement dealer and friend of the model-returning farmers, and Tom Poor, auto merchant, are Hall's good men Friday. Ed Marshall, Legion Post No. 153 Comdr., and genial Lt. Comdr. Tex Witherspoon are in there pitching as are Al Silvers and hundreds of the citizens of Olathe who will be assisted by the entire personnel of the Naval Air Station.

A RECORD IN RETRIEVING. Last year the ships were returned when they flew away and the retrieving record at Olathe is the all-time high. At this writing, only six ships are absent without leave and Tom Poor is still looking for those! The farmers for 50 mi. around were alerted last year, and were super-cooperative. Since they now know what a model airplane is, they will be even more helpful this year. Tom knows how to bring them back, even in pieces if necessary. The best case was the one of the farmer boy who had a Californian ship as an ornament in his room at the farm. Tom heard a rumor and talked to the farmer lad about as follows: "Joe, how would you feel if that prize 4H steer of yours, which won the ribbon at the American Royal, wandered into town and some city dude hid it away in his garage? Think of the hours you spent looking after the critter! Well, it's just the same way with the boy who made the model you have in your room—only more so. He probably spent hundreds of hours planning, building and learning to fly that ship." Yes, the model was delivered to Tom with apologies. Have the boys of last year's meet appreciated the fine job of retrieving the lost ships? You bet they have and they will appreciate it again this year when they discover the comprehensive system of chasing by car and in the air that has been planned.

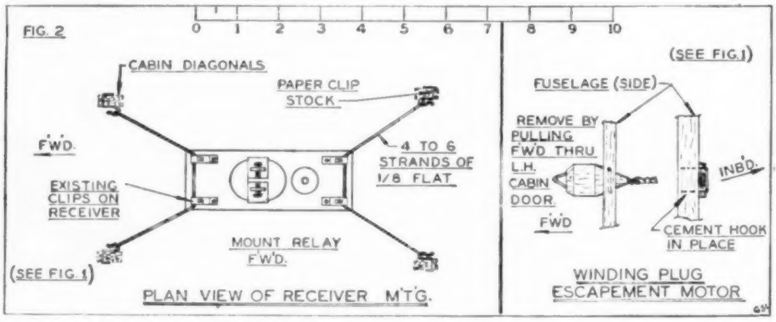
OLATHE IS SOMETHIN'! Interesting is the town of Olathe with its 5,500 people, its showplace that was the home of movie-star Buddy Rogers, and its reputation as the former "Gretna Green" of the nation where people got married day and night. (Now don't let that last item give you any ideas, you Seniors and Opens!)

Then, there is the thrilling atmosphere of the huge inland port at the center of the nation's airlanes, a mile square without a tree. It is a sight to see the mammoth hangers and the newest in navy planes. It will be fun rubbing shoulders with friendly bluejackets and watching celebrities of the model world fly as the days move along. A fellow will be conscious, too, that Olathe was the place where many war heroes trained before they flew out to make history at far-off places during the war.

(*Turn to page* 45)



GENERAL ARRANGEMENT
RADIO CONTROL GEAR
"RUDDER BUG"
(FIG. 1.)



Rudder Bug

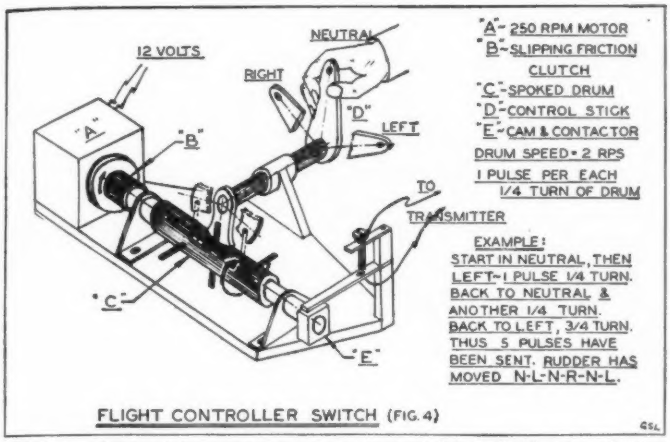
PART TWO

The secret of successful radio control flying is really no secret at all but close adherence to two maxima. One is a thoroughly tested radio control installation; the other is the rigid following of a systematic check-out procedure. It sounds simple but good habits come hard. One reason we feel qualified to give this "advice" is because we have committed most of the radio control mistakes possible and a few horrible ones we dare not admit. (Who was it who launched his radio model after turning the receiver "off" instead of "on"? No answer!!)

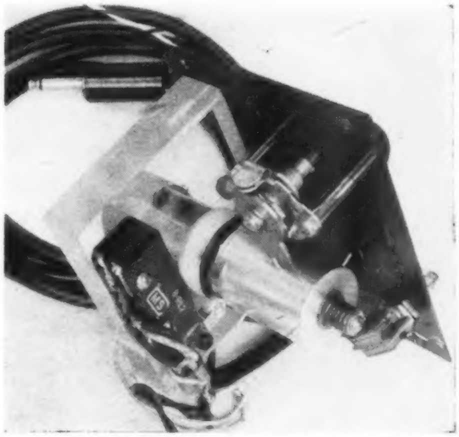
The importance of careful installation and check-out cannot be overemphasized. The consequences are too great—unless you enjoy rebuilding more than you do flying. In a free flight gas job, a loose wire may mean a sputtering motor and a not-so-long flight. In an RC model, a loose radio wire may mean hard-over rudder under full engine power. The result may be a juicy spiral dive followed by thirty days "solitary" in the workshop. With such good reasons, let's be careful.

The installation pointers given here apply to the Good Brothers' Beacon radio gear and also to other similarly sized sets. The following covers the installation of the receiver, the escapement for rudder control, and the batteries. It is also well to read and follow carefully the instruction book which accompanies the radio equipment. In particular, before you start installing in your plane, set up your radio components on a wooden bench and become very familiar with their operation.

Fig. 1 sketches the general arrangement of the radio department in the *Rudder Bug.* The receiver is shock mounted on rubber bands near the C.G. The batteries are securely fastened to the floor of the cabin. The escapement is mounted in the rear with its rubber band coming forward into the cabin. Total radio weight is 1 lb. Although this is not the lightest installation that can



FLIGHT CONTROLLER SWITCH (FIG. 4)



Control box, developed for greater ease in escapement flying, should prove of interest to every R. C. flier who can't remember where neutral is

by Walter A. Good

be made with the Beacon radio unit, it represents a choice of reliable sized batteries. Smaller batteries result in shorter life and also higher operating cost.

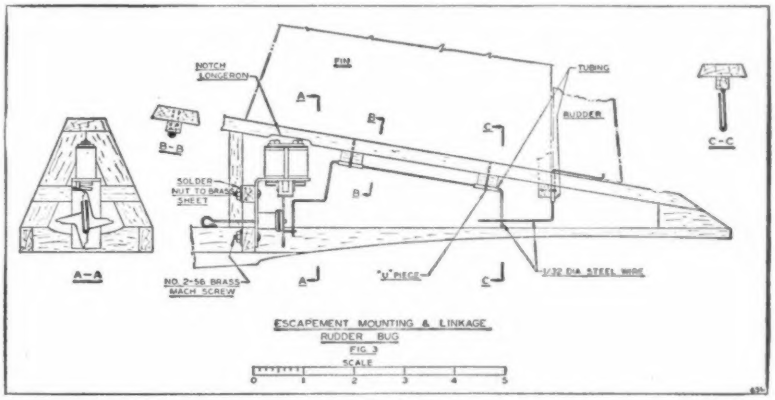
The receiver mounting is shown in Fig. 2 and in the photograph. Anchor the hooks well and cover with fabric for extra strength. Several rubber bands should be used at each end of the receiver; four to six strands of 1/8" flat serve well. If the mounting is too stiff, the motor vibration may bother the relay; if too soft, a hard landing will bounce the receiver from the floor to the ceiling.

All wiring should be neatly done with insulated flexible wire of about No. 22 gauge. Remember that persistent vibration easily fatigues poorly secured wires. Our log book has a note under the date of October 26, 1947, "Never, never use solid wire again." This followed a flying session in which a broken battery wire made intermittent contact during flight. First, the radio would work, then it wouldn't, then it would work again, and so on during a ten-minute flight. It finally quit altogether in the glide about 100' up, but the ship managed to land safely in a tight right circle—it could have been worse.

Follow the wiring diagram in the instruction book and use a good double pole switch. It is wise to check the switch resistance before mounting. If the resistance measures more than 1/10 ohm, don't use it. One side of the switch opens the filament circuit, while the other side opens the escapement circuit.

The antenna in Fig. 1 was copied from Owbridge and Schumacher. It consists of a slack wire from the receiver terminal to a No. 4 brass machine screw aft of the cabin. Outside the body a very flexible bare antenna wire is fastened and then wrapped a number of times around the extended screw. The end of the antenna wire is attached to a short length of rubber band which is secured to the tip of the fin. This allows easy alteration of the length of the antenna merely by wrapping or unwrapping it around the screw.

Test the escapement operation with a wound rubber band on the bench, before installing. It should work on less than 2 volts with a fully wound band. Thus, 3 volts gives considerable safety factor. Mount on the two firm cross members as shown in Fig. 3 and the photograph. The linkage idea was borrowed from Ed Lorenz and has worked quite well. Note

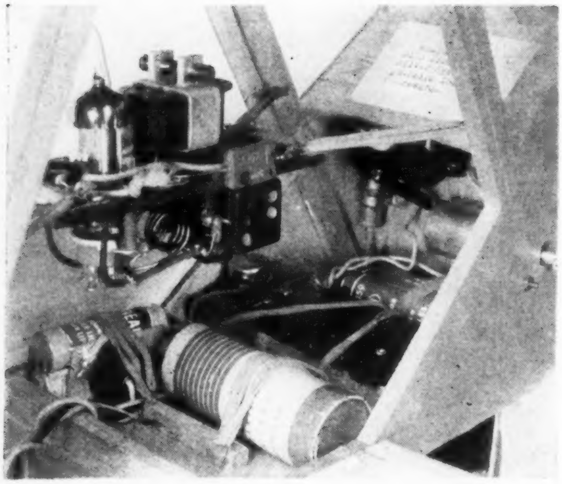


Removal of stabilizer shows escapement mounting and adjustable linkage to rudder

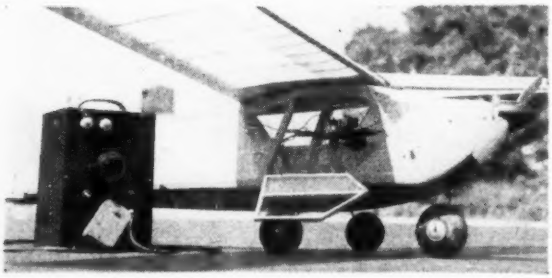
how arm A from the rudder may be bent up or down to quickly change the amount of rudder motion. Bending toward the ground increases the motion. It is best to start with less than 1/8" rudder motion each way, measured at the trailing edge of the flap. Left or right bending of the same arm allows trimming of the "neutral" rudder position to give a straight glide path. Since the linkage is made from 1/32" piano wire, the rudder merely springs over and back if accidentally bumped. The linkage and rudder must not bind in their travel but should be very free with just a "hair" of play in the "U-shaped" wires. Only a few winds in the rubber should cause the system to work.

Two strands (one loop) of 3/32" flat rubber is recommended for this model. It has been flown with two strands of 1/16" flat which had adequate torque. The escapement can handle two strands of 1/8" flat when needed, so the 3/32" represents a very safe compromise. The forward end of the rubber is reached through the cabin door and is wound with a hand drill to show a double row of knots, or about 400 turns. This is adequate for several days of flying.

The two escapement wires are twisted together and tacked to the inside of the body along one of the crutch sides. They are not run near the top of the body because this would place them too close



Large door allows access to receiver, ignition equipment, and batteries



Transmitter with nonautomatic control switch, alongside the plane

to the antenna with possibility of undesirable interaction.

The batteries needed are the 45 volt B, the 1.5 volt A, and the 3 volt escapement battery. Below are listed typical sizes which may be used:—

B—45 volts—Zenith No. Z-30R Plug-In Hearing Aid..6 oz.
A—1.5 volts—Otarion No. GP-2 Plug-In Hearing Aid..3 oz.
Escapement—3 volts—2 pen cells....................1 oz.

We prefer the plug-in type because they are rugged and reliable and eliminate the battery box problem. If you can carry heavier batteries than those listed, it will be found more economical. Soldering up your own batteries can be done but usually leads to more trouble than the plug-in type. After selecting your batteries, distribute them along the floor of the model until the C.G. matches the position (about 36 per cent) found correct in the free flight tests. Make sure a bulkhead is in front of each battery by adding extra cross pieces if necessary. Then cement heavy wire hooks to the crosspieces and fasten the batteries in place with several rubber bands across each battery. "Flying" batteries on hard landings can cause real damage, so strap them down securely.

Little has been said about preparing the transmitter for the field. Construction of a simple antenna support for the transmitter is well repaid by the saving in set-up time at the field. The addition of a flight controller switch at the end of a 7' cable eases flight operation. The switch may be a simple push button type or an automatic one, as shown in the photograph and Fig. 4. This motor-driven switch automatically sends the right number of pulses and will always maintain synchronization between the rudder and the control stick.

The heaviest criticism of the escapement-type control has always been leveled at the possibility of forgetting which rudder position comes next after resting awhile in Neutral. Experience has shown that practice soon "conditions" the operator so he knows what comes next, except when he becomes flustered or confused, and this does happen occasionally! Thus, it was decided to build a laboratory model of an idea which would make the switch automatic, thereby "remembering" for the operator. A surplus 250 rpm motor (A) operated on 12 volts, instead of its rated 27 volts, is the driving power. Running continually, it applies torque through a slipping friction clutch (B) to a spoked drum (C). Drum rotation is prevented when the control stick (D) blocks passage of one of the spokes. Motion of the control stick from Right to Neutral allows the drum to rotate one-quarter turn, very similar to the escapement. Note how the cam and contactor (E) at the end of the drum sends one pulse for each quarter turn. Returning the stick to the Right allows drum motion of three-quarters of a turn and sends out three pulses, just the right number to step the escapement to Left, to Neutral, and to Right. This all happens in the short time interval of less than one-half second as the drum speed is set for about 2 rps. In use, the control stick may be wiggled crazily through any series of motions and the escapement always ends in the same position as the control. The original switch was constructed by Loran Wenrich, at the Johns Hopkins Applied Physics Laboratory, after considerable hours of labor. It worked so nicely in the workshop that we quickly clapped it in a box and took it to the field. Many flights, including radio control take-offs, have been executed by this switch, with the effect of allowing more freedom on the part of the operator. Even a rectangular landing approach pattern consisting of four consecutive right turns offers no mental hazards. A secondary advantage appears in that loss of synchronization between the control and rudder immediately indicates trouble and not a poor memory.

The automatic switch as here presented is not intended as a constructional feature but to show the embodiment of an idea which most probably can be duplicated by a variety of methods.

Now for those all important check-out procedures to be made on the completed installation. The philosophy is to adjust the system so completely at home that it could be flown out of your back yard with no further checks. Thus, the field checks are only to see if it has remained in adjustment. For preliminary tests in the workshop, set the fuselage away from any large metal objects. With the Beacon Receiver, the plate current meter should have very short leads (less than 1 in.) for best results. Long meter leads act like antennas and may alter the settings when the meter is removed from the circuit. Adjust the antenna length according to the instructions to obtain optimum sensitivity. Keying the antennaless transmitter should cause the receiver's 6 ma. idling current to drop to about 3.5 ma. Be sure to use fresh batteries and check them under load with a voltmeter. The B battery should measure between 45 and 36 volts and the A between 1.5 and 1.1 volts. The escapement battery under load should read between 3.0 and 2.4 volts. After recording the two plate current values noted above, it is easiest to set the relay contacts by Gene Foxworthy's method. Insert a 10,000 ohm variable resistor in series with the meter and adjust it to obtain the plate current values desired for the relay setting. Setting "in" 1 ma. from each edge is a convenient rule. Thus, for the above currents, the relay should close at 4.5 ma. and open at 5 ma. Now remove the meter and resistor and observe the over-all operation while keying the transmitter. This completes the indoor tests and we adjourn to the backyard.

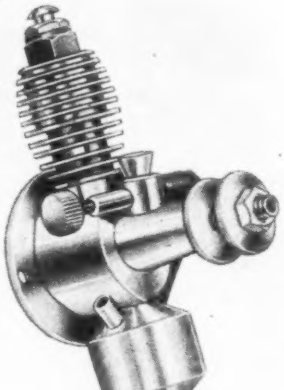
Sometimes with too long a receiver antenna the set "loads" when the model is placed on the ground. The result is poor sensitivity or no operation. Try this with the antennaless transmitter. With a helper on each wing tip, lift the model up to 5' above the ground, all the time keying the transmitter. This may "unload" the set if the receiver antenna is too short and cause the relay not to restore from the contact position. Thus, we have two quick checks on the antenna length.

Next, with the model again on the ground, run the engine at different speeds and while keying observe for proper rudder operation. Look for skipping rudder positions when not keying. Although not common, if skipping should occur, it is easy to localize the trouble—turn off the receiver switch and see if the escapement continues to skip. If it does, chances are propeller unbalance may be responsible because of excessive vibration. If skipping does not continue, then the trouble is probably at the contacts of the sensitive relay, indicating that the receiver mounting rubbers are too stiff, or that the relay contact is set too close to the idling current. In any event, don't take a step toward the field until the skip is completely eliminated; a steadily skipping rudder can give a long straight flight.

If space is available, also make the distance check at home. With the help of a "ham", set up your transmitter with its antenna in a clear area. Have a helper wheel the model away and while keying the transmitter determine the operational limits of the frequency setting knob on the transmitter up to a distance of 500'. Set the knob half-way between your limit marks. Now pack the car, you're ready for the field!

At the field set up the transmitter near the up-wind end of the field. Too much wind is not desirable, but a light breeze will not be harmful. Check the motor for proper operation. Repeat the "unload" test and also the distance check. Now you are ready to fly. Set flight timer for 30 to 60 sec. Turn on the radio gear, run through several positions, and leave in Right rudder. Start the motor and adjust (*Turn to page* 59)

***The Infant Torpedo* has gas tank below the crankcase**



by Edward G. Ingram

DETAILED information about the construction, dimensions and performance of model engines for 1949 is presented in the accompanying tables. The compilation includes spark-ignition and glow-plug engines, compression-ignition engines, four-cycle engines, carbon dioxide engines, and pulse-jet engines. As in past compilations, certain comparative figures which had to be computed, such as engine weight per cubic inch of piston displacement, stroke-bore ratio, etc., are included. The piston displacement is computed from the cylinder bore and stroke of the engines. It should be stated here that all data presented in this article is used as furnished by the various manufacturers.

The past year might well be called Glow-Plug Year, for the use of this type of ignition spread rapidly during 1948. Like the compression-ignition or so-called diesel engine, the glow-plug engine eliminates the need for electrical accessories including flight batteries, and thus makes possible a considerable saving in power plant weight. Many so-called glow-plug engines are simply engines with the electrical accessories removed. Some, however, incorporate design changes, such as larger bearings or a different compression ratio.

An interesting new development in model engines is the advent of a sub-Class A line of engines. The first of these to be marketed was the K & B *Infant Torpedo,* which has a piston displacement of only .020 cu. in.—about one-fifth that

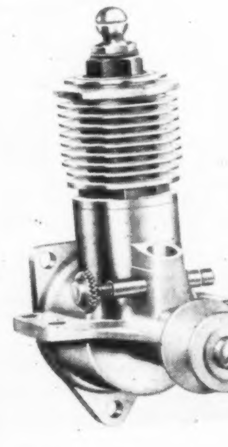
Present Day Motors

of the smallest Class A engines on the market—and which undoubtedly is the world's smallest production-made glow-plug engine, as claimed by the manufacturer. Small enough to cradle in the palm of the hand (weighing but 1 oz.), this little power plant is readily adaptable to rubber band and CO2 kits for flying indoors as well as outdoors. Dispite the fact the K & B *Infant* has an over-all height of only 2-11/16", it is equipped with a shaft type rotary valve and a diminutive built-in fuel tank.

The K & B Hot Point plug is removed for cleaning or replacement by removing the cylinder head with a 7/16-inch open wrench. The plug is then loose and may be taken out easily. Parts for the engine are largely machined from solid stock. The cylinder and piston are steel, and the crankcase, cylinder head, and connecting rod, aluminum alloy. The cylinder has a bore of .281" and a stroke of .331", and the compression ratio is 8 to 1. The engine is designed for radial mounting. It comes equipped with a stamped aluminum propeller which it will turn at 9,500 rpm, according to the manufacturer. The engine will operate on a number of branded fuels or on a mixture of 3 parts methanol, 1 part castor oil, and 1/2 part Liquid Dynamite, T.N.T., or O & R 30-Plus, the manufacturer states.

A standard glow-plug may be used with this *Baby Spitfire*

Largest midget engine so far is this *O. K. Cub* —a separate tank is used



Many builders feel that a new trend in modeling has been started by the midget class of engines, especially so now that two others have been announced. The Anderson *Baby Spitfire,* with a displacement of .045 cu. in. is the second to reach the market. This little engine uses a glow-plug of the usual design. While it will operate on most any standard plug now on the market, the maker recommends use of the style plug furnished with the engine, which was developed especially for it. This engine has many of the features found on the large *Spitfire,* such as a hardened steel piston and connecting rod. A propeller of 6" dia. and 2" pitch is recommended for free flight, while for U-control, 5" dia. and 3-4" pitch is specified.

Still another midget class engine is the "*O. K.*" *Cub,* which with its displacement of .049 cu. in., is the largest of these mighty mites so far announced. The *Cub* is crankshaft rotary valve engine, as are the other two midgets. A 5-1/2—6-1/2" prop. of 4-2" pitch is recommended for this particular engine and speeds with propellers within this range should be from 6000 to 10,000 rpm.

In addition to the *Infant Torpedo,* K & B now produce glow-plug and electric ignition models of the "24", "29", and "32".

The Hornet Motor Manufacturing Co., pioneer in the manufacture of high-speed racing engines, has introduced a conversion kit which is stated to permit the output of the *Hornet* to be stepped up to 1.22 hp at 18,000 rpm. The *Hornet* engine may be obtained with the conversion equipment installed, or the owner of a *Hornet* may secure a conversion kit and install it himself with the aid of the instructions supplied by the manufacturer. Increased power is obtained through the provision of larger cylinder inlet ports which open earlier in the

(*Turn to page* 61)

TABLE 1. MODEL ENGINE CONSTRUCTION DATA

SPARK IGNITION AND GLOW PLUG ENGINES

	Class	Disp., Cu. In.	Cylinder	Cylinder Attachment	Cylinder Head	Head Attachment	Crankcase	Piston	Connecting Rod	Crankpin Bearing	Wristpin Bearing	Crankshaft Bearing	Rotary Valve
K & B Infant	A	.020	Steel	Threaded	Alum. Alloy	Threaded	Al. Alloy-M	Steel-M	Al. Alloy-M	No Bushing	No Bushing	No Bushing	Shaft Type
Baby Spitfire	A	.045	Alloy Steel	Threaded	Alum. Alloy	Threaded	Al. Alloy-PC	Steel, Hardened	Steel, Hardened	No Bushing	Ball and Socket	Bronze Bush.	Shaft Type
"O.K." Cub	A	.049	Steel	Threaded	Alum.	Threaded	Alum.-DC	Steel-HT	Alum.-DC	No Bushing	No Bushing	No Bushing	Shaft Type
Elf Single	A	.097	Copper-Alum., Steel Liner	4 Screws (No Gasket)	Copper-Alum. Alloy	4 Screws (No Gasket)	Copper-Alum.-SC	Al. Alloy, Two-Piece	Alum. Alloy, Turned	No Bushing	No Bushing	2 Bearings Ball Thrust	No
Glo Mite	A	.098	Steel	Screws	....	Screws	....	Steel, Alloy	Steel, Alloy	....	Ball and Socket	Bronze Bushing	Shaft Type
Arden 099	A	.099	Steel, Alloy	Threaded	Alum. Alloy	Threaded	Al. Alloy-DC	Steel, 1440 Cr. Moly	Steel, Cr. Moly	No Bushing	Steel; Ball And Socket	Bronze and 2 Ball	Shaft Type
Buzz A	A	.192	Al. Alloy-PC	Bolts	Alum. Alloy	Integral	Alum. Alloy	Alum. Alloy	Al. Alloy-SC	No Bushing	No Bushing	No Bushing	No
Elf Twin	A	.195	Copper-Alum. -SC, Steel Liner	Screws (No Gasket)	Copper-Alum. Alloy	Screws (No Gasket)	Copper-Alum -SC	Al. Alloy Two-Piece	Alum. Alloy Turned	No Bushing	No Bushing	2 Bearings Ball Thrust	No
Ohlsson 19	A	.197	Steel, Alloy-M	Spot Weld	Steel & Alum.	....	Al. Alloy-DC	Steel-HT	Alum. Alloy	Bronze Bush.	No Bushing	Br. Bush., Ball Th.	Shaft Type
Arden 199	A	.198	Steel, Alloy	Threaded	Al. Alloy-M	Threaded	Al. Alloy-DC	Steel Cr. Moly	Steel, Cr. Moly	No Bushing	Ball and Socket	Br. & 2 Ball	Shaft Type
"O.K." Bantam	A	.199	Steel	Screws	Steel	Integral	Magnesium -DC	Cast Iron	Alum.-DC	No Bushing	No Bushing	Bronze Bush.	Disk Type
Cameron 23	B	.230	Zamak Alloy, -DC	4 Screws	178-T Alloy -M	6 Screws	Zamak Alloy-DC	Iron, Gray	178-T Alloy	No Bushing	No Bushing	Dural	No
Ohlsson 23	B	.232	Steel, Alloy-M	Spot Weld	Steel & Alum.	....	Alum. Alloy -DC	Steel-HT	Alum. Alloy	Bronze Bush.	No Bushing	Br. Bush., Ball Th.	Shaft Type
K&B 24	B	.249	Steel	4 Screws	Al. Alloy-DC	4 Screws	Al. Alloy-DC	Meehanite	Al. Alloy-DC	Bronze Bush.	No Bushing	Bronze Bush.	Shaft Type
Judco	B	.292	Al. Alloy-PM	Bolts	Alum. Alloy	Integral	Alum. Alloy	Alum. Alloy	Alum. Alloy	No Bushing	No Bushing	No Bushing	No
Ram	B	.292	Al. Alloy-PM	Bolts	Alum. Alloy	Integral	Alum. Alloy	Alum. Alloy	Al. Alloy-SC	No Bushing	No Bushing	No Bushing	No
Genie	B	.292	Alum. Alloy -PC	Bolts	Alum. Alloy	Integral	Al. Alloy-PC	Al. Alloy-PC	Al. Alloy, Stamp	No Bushing	No Bushing	No Bushing	No
Thor	B	.292	Al. Alloy-PC	Bolts	Alum. Alloy	Integral	Al. Alloy-PC	Al. Alloy-PC	Al. Alloy, Stamp	No Bushing	No Bushing	No Bushing	No
McCoy 29	B	.296	Al. Alloy -PM or SC	Integral	Al. Alloy -PM or SC	6 Screws	Alum Alloy	Al. Alloy 2 Rings	Al. Alloy, Forged	No Bushing	No Bushing	2 Ball	Disk Type
Forster 29	B	.297	Steel Alloy-HT	4 Screws	Al. Alloy-DC	6 Screws	Al. Alloy-DC	Steel, Hardened	Al. Alloy-DC	Oilite Bush.	No Bushing	Ball	Disk Type
Pierce	B	.297	Steel	Screws	Alum. Alloy	....	Alum. Alloy	Steel	Alum. Alloy	Bronze Bush.	Bronze Bush.	Bronze Bush.	Disk Type
Glo-Champ	B	.297	Steel	Screws	Alum. Alloy	....	Alum. Alloy	Steel	Alum. Alloy	Bronze Bush.	Bronze Bush.	Bronze Bush.	No
Phantom	B	.298	Steel	Screws	Al. Alloy-DC	Screws	Al. Alloy-DC	Iron, Cast	Al. Alloy-DC	Bronze Bush	No Bushing	Bronze Bush.	Shaft Type
Buzz B	B	.299	Al. Alloy-PC	Bolts	Alum. Alloy	Integral	Alum. Alloy	Alum. Alloy	Al. Alloy-SC	No Bushing	No Bushing	No. Bushing	No
K&B Torpedo	B	.299	Steel	4 Screws	Al. Alloy-DC	4 Screws	Al. Alloy-DC	Meehanite	Al. Alloy-DC	Bronze Bush.	No Bushing	Bronze Bush.	Shaft Type
Mohawk Chief	B	.299	Steel	Clamp Plates	Steel	Integral	Alum.-DC	Steel, Hardened	Alum.-DC	No Bushing	No Bushing	No Bushing	Shaft Type
"O.K." Super 29	B	.299	Steel	Clamp Plates	Alum.	5 Screws	Alum.-DC	Steel, Hardened	Alum., Forged	No Bushing	No Bushing	Bronze Bushing	Shaft Type
"O.K." Hot Head	B	.299	Steel	Clamp Plates	Steel	Integral	Alum.-DC	Steel, Hardened	Alum., Forged	No Bushing	No Bushing	No Bushing	Shaft Type
Ohlsson 29	B	.299	Steel, Alloy-M	Spot Weld	Steel & Alum.	....	Al. Alloy-DC	Steel	Alum. Alloy	Bronze Bush.	No Bushing	Roller	Shaft Type
DeLong 30	B	.300	Al. Alloy-DC	4 Screws	Al. Alloy-M	4 Screws	Al. Alloy-DC	Steel, Alloy -M	Al. Alloy, Forged	Bronze Bush.	No Bushing	Bronze Bush.	Disk Type
DeLong 30 Glo-Plug Special	B	.300	Al. Alloy-DC	4 Screws	Al. Alloy-M	4 Screws	Al. Alloy-SC	Steel, Alloy -M	Al. Alloy-M	Roller Needle	No Bushing	2 Ball	Disk Type
Forster 305	C	.304	Steel, Alloy	4 Screws	Al. Alloy-DC	6 Screws	Al. Alloy-DC	Steel, Hardened	Al. Alloy-DC	Oilite Bush.	No Bushing	Ball	Disk Type
K&B 32	C	.321	Al. Alloy-DC	Bolts	Al. Alloy-DC	Bolts	Al. Alloy-DC	Meehan.-SC	Al. Alloy, Forged	No Bushing	No Bushing	Bronze Bush.	Shaft Type
Buzz C	C	.342	Al. Alloy-PC	Bolts	Alum. Alloy	Integral	Alum. Alloy	Alum. Alloy	Al. Alloy-SC	No Bushing	No Bushing	No Bushing	No
Sportsman Jr.	C	.344	Al. Alloy -PM or SC	Integral	Al. Alloy -PM or SC	6 Screws	Alum. Alloy	Al. Alloy -PM or SC	Al. Alloy, Forged	No Bushing	No Bushing	Oilite Bush.	Disk Type
Vivell 35	C	.351	Steel, Bar Stock	2 Screws	Alum. Alloy	4 Screws	Al. Alloy-SC	Iron, Cast	Alum. Alloy	Bronze Bush.	Bronze Bush.	Bronze Bush.	Shaft Type
Elf Four	C	.389	Copper-Al.Alloy -SC Steel Liner	Screws (No Gasket)	Copper-Alum. Alloy	4 Screws (No Gasket)	Copper-Alum. Alloy-SC	Alum., 2 Piece Design	Alum. Alloy, Turned	No Bushing	No Bushing	3-Bearing Ball Thrust	No
H&H (Hot Coil Ig.)	C	.451	Iron, Cast	Threaded	Alum. Alloy	Screws	Alum. Alloy	Steel	Steel & Bronze	....	....	Bronze Bush.	No,
Air-O-Mighty Midget	C	.451	Steel-M	Threaded	Al. Alloy-M	6 Bolts	Al. Alloy-DC	Steel, 2 Rings	Steel	Chrome-Molly	Chrome-Molly	Bronze Bush.	No
Air-O-Cobra	C	.451	Steel-M	Threaded	Al.Alloy-M	Brazed	Al. Alloy-DC	Steel, 2 Rings	Steel	Chrome-Molly	Chrome-Molly	Bronze Bush.	No
Rocket	C	.454	Alum. Alloy	6 Bolts	Alum. Alloy	Integral	Alum. Alloy	Steel, Hardened	Steel, Stamping	No Bushing	No Bushing	Steel Bushing	Rear Shaft
Vivell Forty-Niner	C	.489	Steel, Bar Stock	2 Screws	Steel	Integral	Alum. Alloy, Die Cast	Iron, Cast	Steel, Tool	No Bushing	No Bushing	Bronze Bushing	Shaft Type
Triumph 49	C	.491	Alum., Steel Liner	Integral	Al. Alloy-DC	6 Screws	Alum.-DC	Al. Alloy-PM	Alum.-DC	Bronze Bushing	Bronze Bushing	Br. Bush. Ball Th.	Shaft Type
McCoy Red Head Jr	C	.491	Alum. Alloy PM or SC, Meehan. Liner	Integral	Alum. Alloy -PM or SC	6 Screws	Alum. Alloy	Alum. Alloy -PM or SC 2 Rings	Alum. Alloy, Forged	No Bushing	No Bushing	Ball	Disk Type
Fox 49 Hi-Torque	C	.499	Steel, Alloy	3 Screws	Alum. Alloy -DC	9 Screws	Alum. Alloy -DC	Steel, Cast	Alum. Alloy, Forged	Bronze Bushing	No Bushing	2 Ball	Disk Type
Fox 49 Hi-Speed	C	.499	Steel, Alloy	3 Screws	Al. Alloy-DC	9 Screws	Al. Alloy-DC	Alum. Alloy 2 Rings	Alum. Alloy, Forged	Bronze Bushing	No Bushing	2 Ball	Disk Type
Triumph 51	D	.511	Alum., Steel Liner	Integral	Al. Alloy-DC	6 Screws	Alum.-DC	Al. Alloy-PM	Alum.-DC	Bronze Bushing	Bronze Bushing	Br. Bush., Ball Th.	Shaft Type
G.H.Q.	D	.518	Gray Iron-SC	Bolts	Al. Alloy-PM	Screws	Al. Alloy-PC	Steel, Stamped	Bronze	No Bushing	No Bushing	Bronze Bushing	No
Sportsman Sr.	D	.547	Alum. Alloy -PM or SC	Integral	Alum. Alloy -PM or SC	6 Screws	Alum. Alloy	Alum. Alloy -PM or SC	Alum. Alloy, Forged	No Bushing	No Bushing	Oilite Bushing	Disk Type
Vivell Twin	D	.569	Steel, Bar Stock	4 Screws	Steel	Integral	Al. Alloy-SC	Iron, Cast	Alum. Alloy	No Bushing	No Bushing	Br. Bush., 2 Bearings	Shaft Type
Fox 59 Hi-Torque	D	.594	Steel, Alloy	3 Screws	Alum. Alloy	Screws	Alum. Alloy	Steel, Cast	Alum. Alloy, Forged	Al.-Br. Bush.	No Bushing	2 Ball	Disk Type
Fox 59 Hi-Speed	D	.594	Steel, Alloy	3 Screws	Al. Alloy-DC	9 Screws	Al. Alloy-DC	Alum. Alloy, D.C., 2 Rings	Alum. Alloy, Forged	Bronze Bushing	No Bushing	2 Ball	Disk Type
Contestor D60 & D60S	D	.596	Steel, Carbon -M	Threaded	Al. Alloy-PC	6 Bolts	Alum. Alloy	Steel, 2 Rings	Steel, Forged	Bronze Bushing	No Bushing	Bronze Bushing	Tube Rotary
Wasp Twin 60	D	.604	Alum. Alloy, Intra-Cast	Cast in	Alum. Alloy, Intra-Cast	Screws	Alum. Alloy, Intra-Cast	Steel, Die Formed	Alum. Alloy, Intra-Cast	No Bushing	No Bushing	Bronze Bushing	Shaft Type
Scout Twin	D	.604	Alum Alloy, Steel Liner	Integral	Alum. Alloy	Screws	Alum. Alloy, Centrif. Cast	Steel	Alum. Alloy, Centrif. Cast	No Bushing	No Bushing	Bronze Bushing	Shaft Type
Ball BC	D	.604	Al. Alloy-PM Meehan. Liner	Studs and Nuts	Al. Alloy-PM	Screws	Al. Alloy-PM	Al. Alloy-PM 2 Rings	Alum. Alloy -M	No Bushing	No Bushing	2 Ball	Shaft Type
Fleetwind 60	D	.604	Steel	Cap Screws	Steel	Integral	Al. Alloy-DC	Meehanite	Al. Alloy, Forged	Bronze Bushing	No Bushing	Bronze Bushing	Disk Type
Ohlsson 60	D	.604	Steel, Alloy-M	Spot Weld	Steel & Alum.	....	Al. Alloy-DC	Iron, Cast	Alum. Alloy	Bronze Bushing	No Bushing	Br. Bushing, Ball Thrust	No
"O.K." Super 60	D	.604	Steel	Screws	Steel	Integral	Alum.-DC	Steel, Hardened	Alum., Forged	No Bushing	No Bushing	Br. Bush., B.B., Ball Th.	Shaft Type
Super Cyclone	D	.604	Alum. Alloy -DC, Cast Steel Liner	4 Bolts	Al. Alloy-DC	6 Screws	Al. Alloy-DC	Steel, Cast	Al. Alloy-M	Bronze Bushing	No Bushing	Special Bushing, Ball Thrust	Shaft Type
Bungay 600	D	.607	Al.Alloy-SC, Hard. Steel Liner	4 Bolts	Alum. Alloy, Special Casting	8 Screws	Al. Alloy-SC	Alum. Alloy, Special Casting, 2 Rings	Alum. Alloy, Forged	No Bushing	No Bushing	2 Ball	Shaft Type
Dooling	D	.607	Al. Alloy-PC Iron Liner	Integral	Al. Alloy-PC	8 Screws	Al. Alloy-PC	Alum. Alloy, 2 Rings	Alum. Alloy, Forged	Roller	No Bushing	2 Ball	Disk Type
Hornet—Conversion	D	.607	Al. Alloy-SC Ch. Molly Steel Liner	4 Screws	Al. Alloy-SC	6 Screws	Al. Alloy-SC	Al. Alloy 2 Rings	Al. Alloy Forged	Bronze Bush.	No Bushing	2 Ball	Disk Type
McCoy 60	D	607	Al. Alloy, -PM or SC, Meehanite Liner	Integral	Al. Alloy, -PM or SC	6 Screws	Alum. Alloy	Al. Alloy 2 Rings	Al. Alloy Forged	Bronze Bush.	No Bushing	2 Ball	Disk Type
Buzz D	D	.610	Al. Alloy-PC	Bolts	Alum. Alloy	Integral	Alum. Alloy	Alum. Alloy	Al. Alloy-SC	No Bushing	No Bushing	No Bushing	No
Super Champion JH	D	.624	Steel	3 Through-bolts	Al. Alloy-DC	6 Bolts	Al. Alloy-DC	Al. Alloy 2 Rings	Al. Alloy Forged	Bronze Bush.	No Bushing	Oilite Ball Th.	Shaft plus disc
Thunderbird	D	645	Steel	Screws	Steel	Integral	Al. Alloy-DC	Al. Alloy-DC 2 Rings	Al. Alloy-DC	Bronze Bush.	Bronze Bush.	2 Ball	Rear Shaft Type, Impeller
Super Wasp 65	D	.645	Al. Alloy, Intra Cast Steel Liner	Screws	Al. Alloy, Intra Cast	Screws	Al. Alloy-PM	Steel Die Formed	Al. Alloy Intra Cast	No Bushing	No Bushing	Bronze Bush.	Shaft Type
Anderson Spitfire	D	.647	Al. Alloy-DC, Iron Liner	4 Bolts	Al. Alloy-DC	8 Screws	Al. Alloy-DC	Al. 2 Rings or C. I.	Alum. Alloy Forged	Bronze Bush.	No Bushing	Ball	Shaft Type
Bluestreak	D	.648	Iron, Centrif. Cast	6 Screws	Al. Alloy-M	6 Screws	Al. Alloy-PM	Alum. Alloy	Al. Alloy-M	Alum. Bronze	Alum. Bronze	2 Ball	Shaft Type
Forster Super 99	E	.997	Al. Alloy-DC Steel Liner	4 Screws	Alum. Alloy	Integral	Al. Alloy-DC	Al. Alloy-PM 2 Rings	Al. Alloy-DC	Oilite Bush.	Oilite Bush.	2 Ball	No
"O. K." Twin	E	1.208	Steel	Screws	Steel	Integral	Alum.-DC	Steel, Hardened	Alum., Forged	No Bushing	No Bushing	Br. Bush, B. B., Ball Th.	No
Avion Mercury	E	1.609	Magnesium-SC Steel Liner	Threaded	Magnesium	Integral	Magnesium -SC	Al. Alloy-SC 2 Rings	Alum. Alloy Forged	Bronze Bush.	Bronze Bush.	2 Ball	No

TABLE 1. (Continued)

	Class	Disp., Cu. In.	Cylinder	Cylinder Attachment	Cylinder Head	Head Attachment	Crankcase	Piston	Connecting Rod	Crankpin Bearing	Wristpin Bearing	Crankshaft Bearing	Rotary Valve
COMPRESSION-IGNITION ENGINES													
Mite Diesel	A	.098	Steel	Screws	....	Screws	....	Steel, Alloy	Steel, Alloy	....	Ball & Socket	Bronze Bush.	Shaft Type
Deesil A	A	.125	Steel, Al. Fins	4 Screws	....	Contra Piston	Alum. Alloy	Steel	Brass	No Bushing	No Bushing	Bronze Bush.	No
Micro-Diesel	A	.130	Steel, M	Integral	Al. Alloy-M	Threaded	Al. Alloy-SC	Steel, M	Bronze	No Bushing	Ball & Socket	Bronze Bush.	No
Air-O-Diesel	B	.278	Steel, M	Threaded	Al. Machined	4 Bolts	Alum., DC	Steel, M	Steel	Chrome-Moly	Chrome-Moly	Bronze Bush.	No
Drone Diesel	B	.296	Al. Alloy-SC Steel Liner	Integral	Alum., M	4 Bolts	Alum., SC	Iron, Cast	Alum. Alloy, Forged	Bronze Bush.	No Bushing	Ball	Shaft Type
Speed Demon	B	.296	Outer Alum. Inner Steel	Outer, Screws Inner Movable	Outer Alum. Inner, Steel	Outer Integral, Inner, Pressed On	Alum. Alloy Bar Stock	Iron, Cast	Steel, Cold Rolled	Oilite Bush.	Oilite Bush.	Oilite Bush.	No
FOUR-CYCLE ENGINES (SPARK-IGNITION)													
Burgess M-5 Radial	E	.942	Al. Alloy-DC Steel Liner	Screws	Alum. Alloy	Integral	Al. Alloy-DC	Al. Alloy Cast	Al. Alloy-DC	Master rod Oilite Bush.	No Bushing	2 Ball	Poppet valves Dia. ⅛"
CARBON DIOXIDE ENGINES													
Campus A-100		.0015	Steel	Threaded	Steel	Threaded	Alum. Alloy	Steel	Bronze	No Bushing	No Bushing	No Bushing	Ball
Buzz CO_2		.0052	Bronze	Threaded	Bronze	Integral	Alum.-PM	Steel	Bronze	No Bushing	No Bushing	No Bushing	Ball
"O. K." CO_2		.0178	Steel	Threaded	Bronze	Threaded	Alum.	Steel-HT	Alum.-DC	No Bushing	No Bushing	No Bushing	Ball

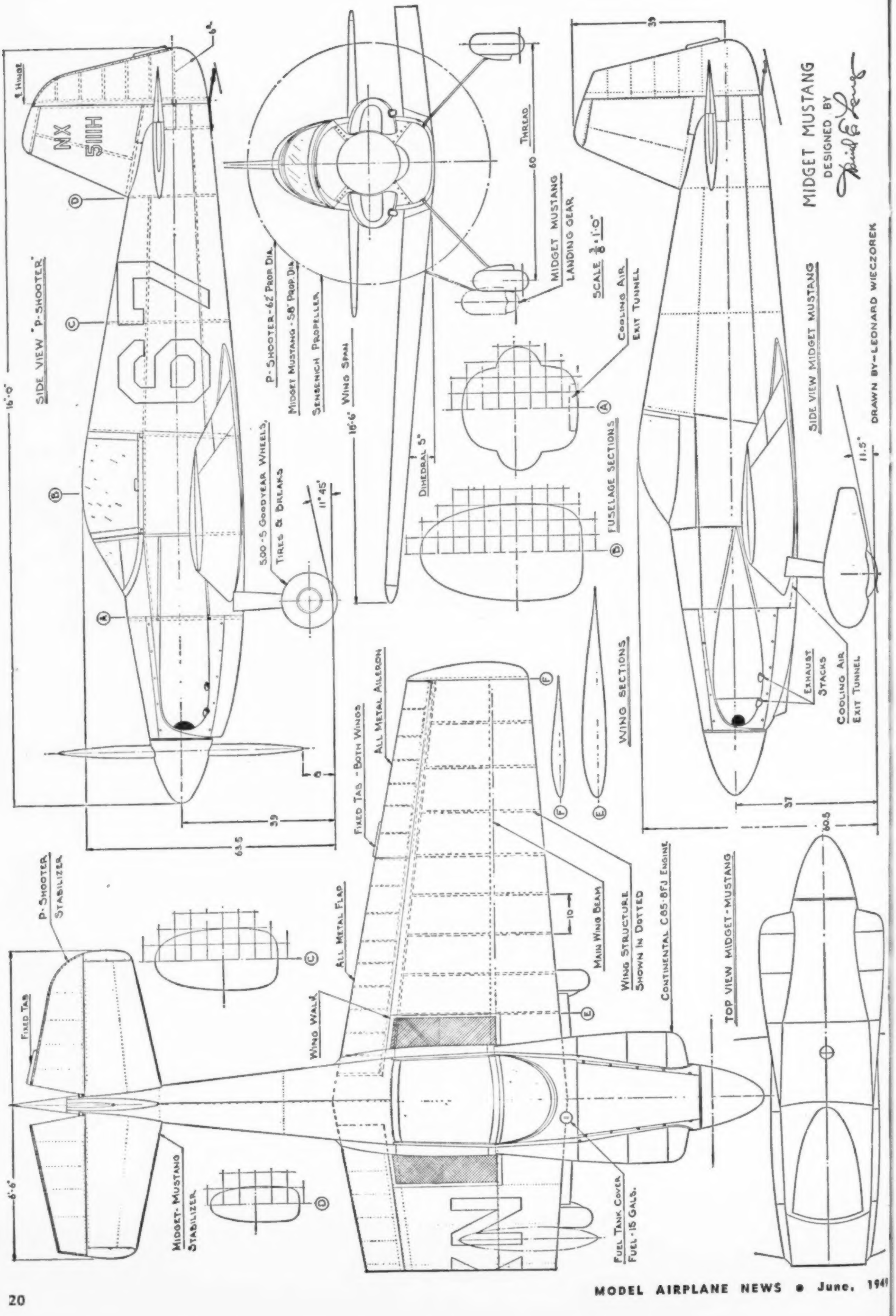
Abbreviations used in above listings: SC—Sand Cast; PM—Permanent Mold Cast; PC—Pressure Die Cast; DC—Die Cast; M—Machined; HT—Heat Treated

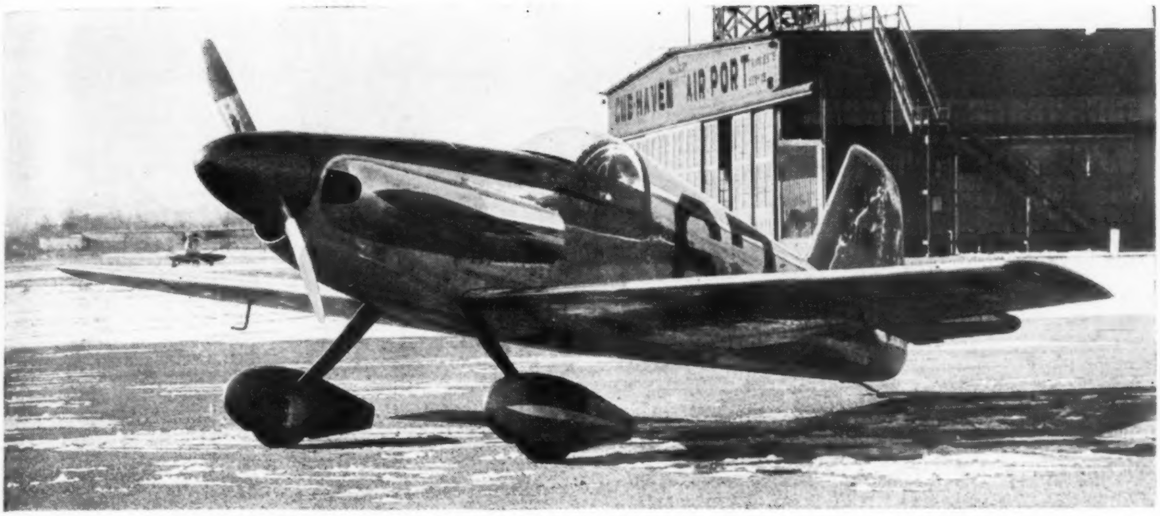
TABLE 2. MODEL ENGINE DIMENSIONS AND PERFORMANCE DATA

SPARK IGNITION AND GLOW PLUG ENGINES

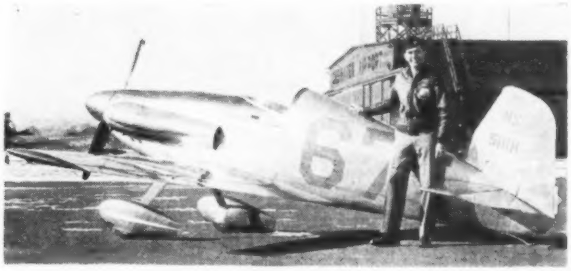
(This chart was prepared solely from data supplied by the manufacturers—we cannot guarantee any of the figures listed)

	Class	Displacement Cu. In.	Bare Engine Weight, Ozs.	Weight Per Cu. In Disp., Lbs.	No. of Cylinders	Cylinder Bore and Stroke	Stroke-Bore Ratio (to 1)	Cylinder Compression Ratio (to 1)	Rated Horsepower	Revolutions Per Minute at Rated Horsepower	Maximum Brake Horsepower	Revolutions Per Minute at Max. Brake H. P.	Max. Brake H.P. per Cu. In. Disp.	Engine Weight per Brake H.P. Lbs.	Recommended Propeller Dia., In.	Recommended Propeller Pitch, In.	Revolutions Per Minute with Recommended Prop.	Type of Mount
K&B Infant	A	.020	1.00	3.12	1	.281 x .331	1.18	8.00	.....	......	.....	......	.....	.....	5	2	9,500	Radial
"OK" Cub	A	.049	1.50	.....	1	.390 x .415	....	6.00	.....	......	.....	......	.....	.....	5¼-6¼	4-2	15,000-6,000	Rad.-Beam
Baby Spitfire	A	.045	1.00	....	1	.375 x .406	....	.....	.....	......	.....	......	.....	.....	....	......	......	Radial
Elf Single	A	.097	3.00	1.93	1	.468 x .564	1.21	7.00	1/10	10,000	.....	......	.....	.....	8	6	......	Rad.-Beam
Glo-Mite	A	.098	2.70	1.72	1	.5000 x .500	1.00	.....	.....	......	.....	......	.....	.....	8	6	9,000	Beam
Arden 099	A	.099	2.62	1.63	1	.495 x .516	1.04	9.00	1/10	10,000	.....	......	.....	.....	8	4	10,000	Radial
Buzz A	A	.192	4.00	1.30	1	.660 x .562	.85	8.00	1/7	7,500	.....	......	.....	.....	8	6	9,000	Beam
Elf Twin	A	.195	5.00	1.60	2	.468 x .564	1.21	.....	1/5	10,000	.....	......	.....	.....	10	6	......	Radial
Ohlsson 19	A	.197	5.00	1.59	1	.687 x .531	.77	7.00	.....	8,200	.....	......	.....	.....	8-10	7-4	9,500+	Rad.-Beam
Arden 199	A	.198	4.16	1.31	1	.635 x .625	.98	9.00	1/5	10,000	.....	......	.....	.....	7	8	......	Radial
"O.K." Bantam	A	.199	3.25	.....	1	.656 x .590	.90	7.00	.....	......	.....	......	.....	.....	7-9	8-4	11,900-5,000	Beam
Cameron 23	B	.230	5.75	1.56	1	.625 x .750	1.20	7.00	1/5	9,300	.....	......	.....	.....	10	5	9,000	Rad.-Beam
Ohlsson 23	B	.232	5.00	1.35	1	.687 x .625	.91	7.50	.....	9,400	.....	......	.....	.....	8-10	9-5	7,000+	Rad.-Beam
K&B 24	B	.249	7.00	1.76	1	.662 x .724	1.09	7.00	1/5	......	.....	......	.....	.....	10	......	8,750	Rad.-Beam
Judco	B	.292	4.25	.91	1	.812 x .562	.69	9.00	1/6	8,000	.....	......	.....	.....	10	6	7,500	Beam
Ram	B	.292	4.75	1.01	1	.812 x .562	.69	9.00	1/6	6,800	.....	......	.....	.....	11	6	8,000	Beam
Genie	B	.292	4.00	.86	1	.812 x .562	.69	9.00	1/6	8,000	.....	......	.....	.....	11	6	8,000	Beam
Thor	B	.292	4.25	.91	1	.812 x .562	.69	9.00	1/6	8,000	.....	......	.....	.....	11	6	7,500	Beam
McCoy 29	B	.296	6.00	1.27	1	.750 x .670	.89	8.50	.65	14,000	.....	......	.....	.....	8	8	14,000	Beam
Forster 29	B	.297	6.50	1.37	1	.750 x .672	.90	9.00	With gasoline fuel		.32	11,300	1.078	1.21	7-10	9-6	......	Rad.-Beam
Pierce	B	.297	.....	.....	1	....	....	.....	1/5	......	.....	......	.....	.....	....	......	......	Beam
Glo-Champ	B	.297	.....	.....	1	....	....	.....	1/5	......	.....	......	.....	.....	....	......	......	Beam
Phantom P-30	B	.298	6.87	1.44	1	.711 x .750	1.05	5.50	1/5	......	.....	......	.....	.....	8	10	10,500	Beam
Buzz B	B	.299	4.50	.96	1	.812 x .562	.69	9.00	1/6	8,000	.....	......	.....	.....	10	6	7,000	Beam
K&B Torpedo	B	.299	7.50	1.51	1	.725 x .724	1.00	6.90	.257	10,500	.....	......	.....	.....	11	6	9,200	Rad.-Beam
"O.K." Super 29	B	.299	7.50	.....	1	.760 x .660	.87	7.00	.....	......	.....	......	.....	.....	8-11	8-6	11,800-5,000	Rad.-Beam
"O.K." Hot-Head	B	.299	7.00	1.46	1	.760 x .660	.87	7.00	.....	......	.....	......	.....	.....	8-11	8-6	11,800-5,000	Rad.-Beam
Mohawk Chief	B	.299	7.00	1.46	1	.760 x .660	.87	7.00	.....	......	.....	......	.....	.....	11-8	6-8	11,800-5,000	Beam
Ohlsson 29	B	.299	5.00	1.04	1	.760 x .660	.87	7.50	.....	......	.40	10,500	1.34	.781	....	......	......	Rad.-Beam
DeLong 30	B	.300	8.00	1.67	.	.748 x .680	.90	10.00	1/5	11,000	.....	......	.....	.....	8	10	11,000	Beam
DeLong 30 Glo.	B	.300	8.50	1.77	1	.748 x .680	.90	9.00	.51	15,000	.....	......	.....	.....	7	10	15,000	Beam
Forster 305	C	.304	6.50	1.34	1	.760 x .672	.88	9.00	.....	......	.....	......	.....	.....	7-10	9-6	......	Rad.-Beam
K&B 32	C	.321	6.00	1.17	1	.750 x .725	.97	8.50	.....	......	.....	......	.....	.....	11	6	10,500	Rad.-Beam
Buzz C	C	.342	4.50	.82	1	.880 x .562	.64	9.00	1/5	8,500	.....	......	.....	.....	11	6	9,000	Beam
Sportsman Jr.	C	.344	6.00	1.10	1	.809 x .670	.83	8.50	.53	13,000	.....	......	.....	.....	10	6	13,000	Beam
Vivell 35	C	.351	7.25	1.29	1	.765 x .763	1.00	.....	1/5	9,000	.....	......	.....	.....	11	6	9,500	Beam
Elf Four	C	.389	9.00	1.45	4	.468 x .564	1.21	7.00	1/2	10,000	.....	......	.....	.....	11	6	......	Radial
H&H (Hot Coil Ig.)	C	.451	8.00	1.11	1	.875 x .750	.86	.....	.....	......	.....	......	.....	.....	10-12	8	......	Beam
Air-O-Mighty Midget	C	.451	7.25	1.00	1	.875 x .750	.86	8.00	.61	12,400	.....	......	.....	.....	11	7	12,400	Beam
Air-O-Cobra	C	.451	7.50	1.04	1	.875 x .750	.86	7.00	.....	......	.....	......	.....	.....	11	7	10,500	Beam
Rocket	C	.454	9.00	1.24	1	.812 x .875	1.08	.....	.....	......	.....	......	.....	.....	....	......	......	Beam
Vivell Forty-Niner	C	.489	7.50	.96	1	.859 x .844	.98	.....	1/4	10,000	.....	......	.....	.....	11	8	10,000	Beam
Triumph 49	C	.490	8.50	1.08	1	.890 x .790	.89	7.50	.....	......	.....	......	.....	.....	11	8	9,900	Rad.-Beam
McCoy Red Head Jr.	C	.491	11.00	1.40	1	.890 x .790	.89	9.00	.90	15,000	.....	......	.....	.....	9	10	15,000	Beam
Fox 49 Hi-Torque	C	.499	9.00	1.13	1	.937 x .735	....	6.00	.90	12,000	.....	......	.....	.....	13	.....	8,500+	Beam
Fox 49 Hi-Speed	C	.499	9.00	1.13	1	.937 x .735	....	6.00	1.00	16,000	.....	......	.....	.....	8	8-10	15,000+	Beam
Triumph 51	D	.510	8.50	1.04	1	.900 x .790	.88	7.50	.....	......	.....	......	.....	.....	11	8	9,900	Rad.-Beam
G.H.Q.	D	.518	10.00	1.21	1	.937 x .750	.80	5.00	1/5	7,000	.....	......	.....	.....	14	8	8,000	Beam
Sportsman Sr.	D	.547	10.00	1.14	1	.940 x .790	.84	9.00	.80	12,000	.....	......	.....	.....	10	8	12,000	Beam
Vivell Twin	D	.569	14.00	1.54	2	.726 x .687	.95	.....	3/8	9,000	.....	......	.....	.....	12	6	9,000	Radial
Fox 59 Hi-Torque	D	.594	9.50	1.00	1	.937 x .860	.92	6.00	4/5	10,000	1.00	15,000	1.686	.59	13	.....	9,600	Beam
Fox 59 Hi-Speed	D	.594	9.25	.97	1	.937 x .860	.92	6.00	1-1/8	16,000	1.437	22,000	2.42	.40	8	12	16,000+	Beam
Contestor D60 & D608	D	.596	11.50	1.21	1	.945 x .850	.90	6.80	1/2	11,000	.....	......	.....	.....	7-8	12-10	10-12,000	Beam
Wasp Twin 60	D	.604	12.00	1.24	2	.740 x .702	.95	6.50	1/2	9,000	.....	......	.....	.....	10	8	8,000	Beam
Scout Twin	D	.604	11.00	1.14	2	.740 x .702	.95	7.00	.40	8,500	.....	......	.....	.....	10	8	8,500	Beam
Ball BC	D	.604	15.00	1.55	1	.924 x .900	.97	10.00	.....	......	1.00+	20,000	1.656+	.938	9	12	......	Beam
Fleetwind 60	D	.604	12.00	1.24	1	.937 x .875	.93	5.60	7/16	8,500	7/16	8,500	.724	1.71	12-10	8-10	8,000	Beam
Ohlsson 60	D	.604	9.00	.93	1	.937 x .875	.93	6.50	.....	8,150	.....	......	.....	.....	11-14	10-6	7,000+	Rad.-Beam
"O.K." Super 60	D	.604	12.00	1.24	1	.900 x .950	1.07	8.00	.....	......	.....	......	.....	.....	11-15	9-6	10,000-5,000	Beam
Super Cyclone	D	.604	9.50	.98	1	.906 x .937	1.03	5.00	.....	......	.....	......	.....	.....	13-14	6-8	9,000	Beam
Bungay 600	D	.607	16.25	1.67	1	.940 x .875	.93	9.80	.....	......	.....	......	.....	.....	....	......	......	Beam
Dooling	D	.607	14.00	1.44	1	1.015 x .750	.74	9.00	1½	16,000	1½	16,000	2.47	.583	8-9	9-11	15,500	Beam
Hornet Conversion	D	.607	14.00	1.44	1	.940 x .875	.93	10.00	.....	......	1.22	18,000	2.01	.717	9	9	19,000	Beam
McCoy 60	D	.607	14.00	1.44	1	.940 x .875	.93	9.50	1.44	16,000	.....	......	.....	.....	9	12	16,000	Beam
Buzz D	D	.610	9.00	.92	1	1.000 x .777	.78	9.00	1/4	9,000	.....	......	.....	.....	12	6	11,000	Beam
Super Champion JH	D	.624	12.00	1.20	1	.940 x .900	.96	6.50	.65	12,500	.....	......	.....	.....	13	6-8	8,500	Beam
Thunderbird 65	D	.645	13.00	1.26	1	.968 x .875	.90	6.00	.....	......	.....	......	.....	.....	10	10	11,900	Beam
Super Wasp 65	D	.645	12.00	1.17	2	.740 x .750	1.01	6.50	.80	13,000	.....	......	.....	.....	10	8	10,000	Radial
Anderson Spitfire	D	.647	12.00	1.16	1	.937 x .937	1.00	7.00	1/2	10,000	.....	......	.....	.....	13	6-7	11,000	Beam
Bluestreak	D	.648	12.00	1.16	1	.940 x .934	.99	11.00	1+	15,000	.....	......	.....	.....	9-11-13	9-8-6	......	Beam
Forster Super 90	E	.997	14.00	.94	1	1.062 x 1.125	1.06	8.00	.....	Gasoline	.62	7,000	.622	1.37	14-16	6-8	......	Beam
"O.K." Twin	E	1.208	22.00	1.15	2	.900 x .950	1.07	6.00	1/2	5,600	.....	......	.....	.....	16-18	12-6	6,000-1,500	Radial
Avion Mercury	E	1.609	20.00	.78	1	1.250 x 1.312	1.05	9.45	.....	......	.75	5,200	.466	1.67	20	10	4,000	Beam
COMPRESSION-IGNITION ENGINES																		
Mite Diesel	A	.098	2.60	1.66	1	.500 x .500	1.00	13.50	.....	......	.....	......	.....	.....	8	6	9,000	Beam
Deesil A	A	.125	5.00	2.50	1	.473 x .708	1.50	Adjustable	.....	8,000	.....	......	.....	.....	8-10	10-6	8,000	Beam
Micro-Diesel	A	.130	5.00	2.40	1	....	....	Adjustable	1/7	6,800	.....	......	.....	.....	10	4	6,800	Beam
Air-O-Diesel	B	.278	7.00	1.57	1	.687 x .750	1.09	Adjustable	.....	......	.....	......	.....	.....	12	7	7,000	Beam
Drone Diesel	B	.296	9.00	1.90	1	.656 x .875	1.33	18.50	1/4	7,000	.....	......	.....	.....	11	10	7,000	Rad.-Beam
Speed Demon	B	.296	10.50	2.22	1	.656 x .875	1.33	12.00	1/5	6,000	.....	......	.....	.....	11	8	6,100	Beam
FOUR-CYCLE ENGINES (SPARK-IGNITION)																		
Burgess M-5, Radial	E	.942	22.00	1.46	5	.632 x .600	.95	5.50	1/2	3,500	.....	......	.....	.....	....	......	......	Radial
CARBON DIOXIDE ENGINES																		
Campus A100	..	.0015	.25	....	1	.125 x .125	1.00	.....	.....	8,000	.....	......	.....	.....	4	2	4-8,000	Radial
Buzz CO2	..	.0052	.62	....	1	.187 x .187	1.00	.....	.....	......	.....	......	.....	.....	5½	3	6,000	Radial
"OK" CO2	..	.00178	.75	....	1	.275 x .300	1.09	.....	.....	......	.....	......	.....	.....	5-7	4-2	7,000-3,000	Radial


MIDGET MUSTANG
DESIGNED BY
DRAWN BY-LEONARD WIECZOREK
SIDE VIEW "P-SHOOTER"
NX
5111H
16'-0"
SIDE VIEW MIDGET MUSTANG
P-SHOOTER-62" PROP. DIA.
MIDGET MUSTANG-58" PROP. DIA.
SENSENICH PROPELLER
16'-6" WING SPAN
DIHEDRAL 5°
THREAD
MIDGET MUSTANG
LANDING GEAR
SCALE 1/8":1'-0"
COOLING AIR
EXIT TUNNEL
FUSELAGE SECTIONS
5.00-5 GOODYEAR WHEELS,
TIRES & BRAKES
WING SECTIONS
FIXED TAB - BOTH WINGS
ALL METAL AILERON
ALL METAL FLAP
WING WALK
MAIN WING BEAM
WING STRUCTURE
SHOWN IN DOTTED
CONTINENTAL C85-8FJ ENGINE
TOP VIEW MIDGET-MUSTANG
FUEL TANK COVER
FUEL-15 GALS.
P-SHOOTER
STABILIZER
MIDGET-MUSTANG
STABILIZER
FIXED TAB
EXHAUST
STACKS
COOLING AIR
EXIT TUNNEL



midget mustang



by Robert McLarren

THERE were few pilots among the spectators at the 1948 National Air Races, Cleveland, Ohio, who watched the various heats and finals of the Goodyear Trophy event without saying to himself: "Gosh I'd like to have one of those racers —not to *do* anything with but just to putter around in!" The tiny speedsters were trim like racers but safe like licensed personal aircraft, fast like pursuit planes yet slow enough for ease of handling. Briefly, they seemed ideal for the man who just wants to fly, the kind of pilot who honestly loves the air and airplanes, the kind that gets a genuine thrill out of a loop or high-speed turn, instead of the woozy feeling of the layman!

Well, if Dave Long and Ernest and Paul Schweizer have anything to say about it, such pilots are going to have their chance to own one of those racers—and at a price that a genuine desire makes reasonable. For Dave Long flew "No. 67" in the 1948 National Air Races at Cleveland and the 1949 All-American Air Maneuvers at Miami. Although victories in these Goodyear and Continental Trophy races would have made good publicity for the new project, unfortunately Dave Long didn't win any trophies in either event, although he did beat out veteran Art Chester in the Continental event in Miami last January, no mean feat—not only for an airplane but for a racing pilot!

But neither Dave Long nor the Schweizer brothers are too disappointed in this because it only goes to show that their *Midget Mustang* is not an all-out speed demon, which its pilot dares fly only for cash prizes, but rather a conservative though fast private plane. Proof of this is seen in the fact that Long has flown his tiny craft cross-country for thousands of miles without mishap. For example, he traveled the 1150 mi. from Lock Haven Pa., to Miami in 7 hr. 20 min. against headwinds but still averaged 160 mph. As a matter of fact, he averaged 186 mph. on the Lock Haven-Richmond leg of the trip, which isn't a bad cruising speed for an airplane that weighs only 500 lb.!

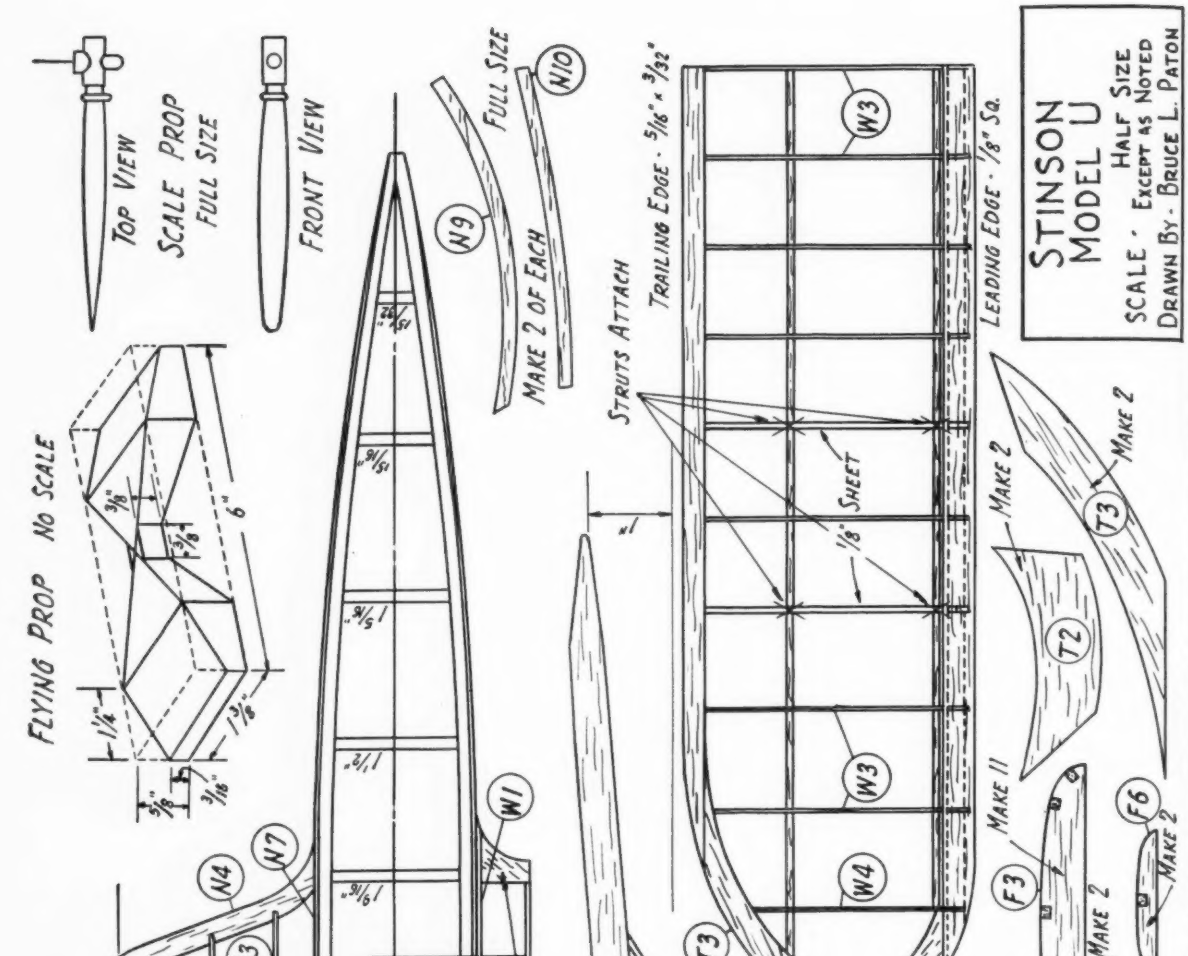
Dave Long has a full-time job as design engineer with Piper Aircraft Corp., Lock Haven, Pa., where he has been employed since 1937. During the war he took a three-year leave-of-absence from Piper to become a pilot with the ATC. After the war, Long began design work on his little "dream plane", but he managed to carry his ideas through to completion and built the tiny speedster during his evenings and week ends. When the rigid requirements of the Professional Race Pilots Association were announced for the Goodyear Trophy Race at the National Air Races, Long found that his own ideas had followed these rules with amazing fidelity and he had to make only a few minor modifications of his airplane to qualify for entry in the event. His failure to cop the Goodyear Trophy was due to mechanical difficulties and not to any inferiority in design or construction of his tiny racer—he pulled out of the Goodyear Final in the ninth lap with a fuel vapor lock.

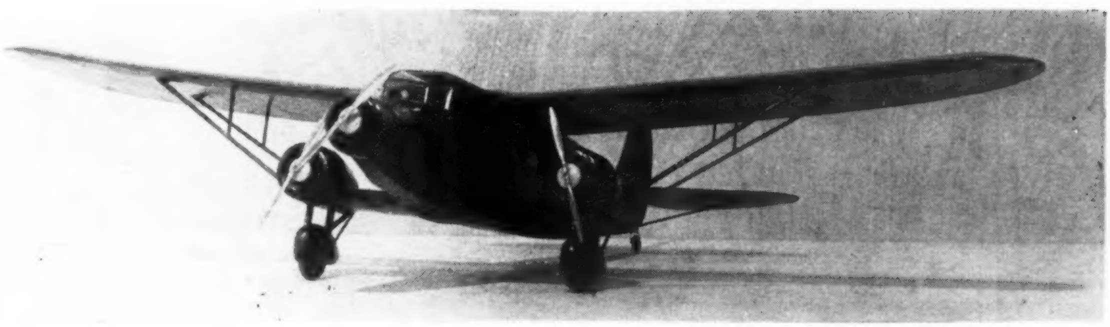
Following the races, Long got to thinking about the hordes of curious spectators (and other race pilots) that swarmed over his plane at Cleveland as well as the mail inquiries he received and he decided that the odds were good enough to warrant the manufacture of his design. But like many others, Long was faced with a lack of capital, facilities, etc. that becalmed his aggressive ideas until the Schweizer Bros. entered the picture with a partnership offer. Famed glider designers and manufacturers, Schweizer Aircraft Corp., Elmira, N.Y., has gained top rank in its field. With a modern plant and a less-than-peak glider business, it was only natural that the Schweizer brothers should cast about for a project that fell within their capabilities. The Long *Midget Mustang* fit the bill to a "T" and thus the formation of a joint venture between Schweizer and Dave Long.

The *Midget Mustang* is all-metal construction and features a laminar-flow airfoil with its maximum thickness back at the 40% chord point, instead of about 25% as on conventional sections. This preservation of laminar flow almost half-way back from the leading edge means that the turbulent flow with its high drag affects only the rear half of the wing, instead of the rear three-quarters, or a saving of about 25% in drag. The wing has a 2:1 taper ratio and employs 2° of washout plus differential aileron linkage. These features combine to give the midget racer exceptionally good stall characteristics, which assume positive aileron action throughout the stall. The wing area is only 69 sq. ft., but this is actually more than the minimum required for the Goodyear and Continental events!

One of the improvements Long has made in the change from a hand-built racer to a production personal plane is the use of torsion tube suspension of the main gear from a tube passing through a support bearing in the main spar and extending aft to a rigid attachment on the rear spar. The new gear places the neatly panted wheels entirely outside the propeller slipstream and also increases the tread to lessen any ground looping tendencies. Goodyear 5.00 x 5 tires and wheels

(*Turn to page* 48)


STINSON MODEL U
SCALE · HALF SIZE EXCEPT AS NOTED
DRAWN BY · BRUCE L. PATON
TOP VIEW
SCALE PROP FULL SIZE
FRONT VIEW
FLYING PROP NO SCALE
FULL SIZE
MAKE 2 OF EACH
STRUTS ATTACH
TRAILING EDGE · 5/16" x 3/32"
LEADING EDGE · 1/8" SQ.
1/8" SHEET
MAKE 2
MAKE 11
MAKE 1
MAKE 2
1/16" SHEET FULL SIZE
ALL FORMERS SHOWN FULL SIZE
SOFT BALSA FILLETS
SOFT BALSA SHAPED AFTER NACELLE IS ASSEMBLED
SIDE VIEW OF NACELLE
SIDE STRINGERS OMITTED FOR CLARITY
1/8" x 1/16"
1/4" x 1/8"
N1 N2 N3 N4 N5 N6 N7 N8 N9 N10
W1 W2 W3 W4
T1 T2 T3
F1 F2 F3 F4 F5 F6



Stinson ★★★ Trimotor

by Bruce L. Paton

THE Stinson *Trimotor*, although a fine ship in the early 1930's, did not see many years of service with the nation's airlines because of the advent of the faster low-wing transports. Originally intended to supplant the "Old Tin Goose" of the airlines, the venerable Ford, its speed could not compare with that of the Boeing 247 and the early Douglas DC's, and it quickly took a back seat to these two transports.

The proportions of this Stinson, with just a slight increase in tail area, make an excellent flying scale model, and with a winder packing in the turns you can give the contest jobs a run for their money. There is still nothing to compare with the thrill of seeing a scale model R.O.G., circle lazily up and up, and then settle into a slow, flat glide. You old-timers especially will get a kick out of this model's looks and performance.

FUSELAGE: The construction of the fuselage is started by laying out the two sides of 1/8" balsa. After these are thoroughly dry, cement in the top and bottom cross members, the dimensions of which are given in the half size top view. The formers are now cut out and installed. When these are dry, the 1/16" sq. stringers and cabin frame are added. It should be noted here that the former N8 on the fuselage has a 3/4" sq. cut out of the exact center and this square is later cemented to the rear of the cowl for locating purposes. This cutout need not be made on the formers for the nacelles. The side windows are cut out of 1/16" sheet balsa and installed as shown on the plan. The tail wheel may be attached now or after fuselage has been covered.

NACELLES: The first step in building up the nacelles is to cut out and install formers N1 and N3 on the fuselage structure. Only half of these two formers have been shown on the plan; however, for purposes of strength they should be cut out in one piece. While these are drying in place, start constructing the landing gear. The three pieces making up each wheel cover are cut out and cemented together; make sure to provide slots for music wire as shown. When these are dry, form a U of wire around each wheel and insert the top of each U up through the pants, then bend the top ends of this U in toward each other as shown on the plan. The gear is then bound and cemented securely to the back of former N1. The slight forward angle of the landing gear as shown on the fuselage side view should now be incorporated. The main landing gear struts should be streamlined and installed at this time. Note that these struts are slotted to receive the landing gear wire. The next step is to install formers N2, locating them with N9 and N10. The 1/16" sq. stringers are then put in place. The N8 formers are cut out and assembled and the soft balsa blocks at the rear of each nacelle are cemented in place and when dry, are shaped. The trailing edge of each sub-wing, N4, and the ribs N5, N6 and N7 are cemented in place. The leading edge is cut from 3/16" sheet and is shaped to conform to the taper of that section of former N1 on which it is cemented. A soft balsa block is cemented to N7 and the leading edge, and sanded to fillet shape when dry.

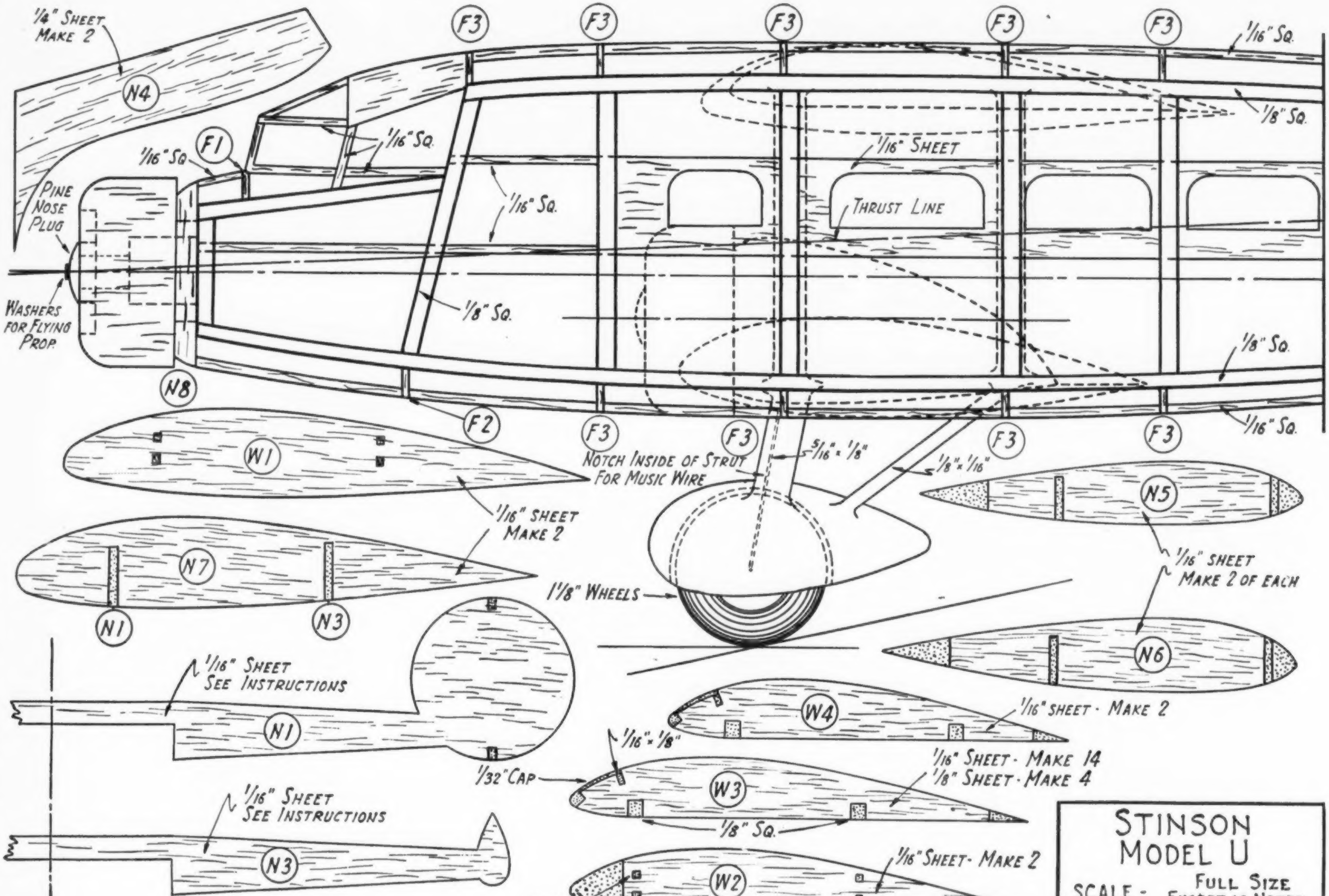
If you have a lathe available the cowls can be made in nothing flat, but if you don't, they may be made up by the sandwich method, using 1/8" soft balsa sheet. The outer cowls may be hollowed out to as thin a wall as possible to save weight, but don't hollow out the nose cowl any more than is shown on the fuselage side view because this will weaken the nose and there will not be enough material left to attach the square cut from former N8, as mentioned previously.

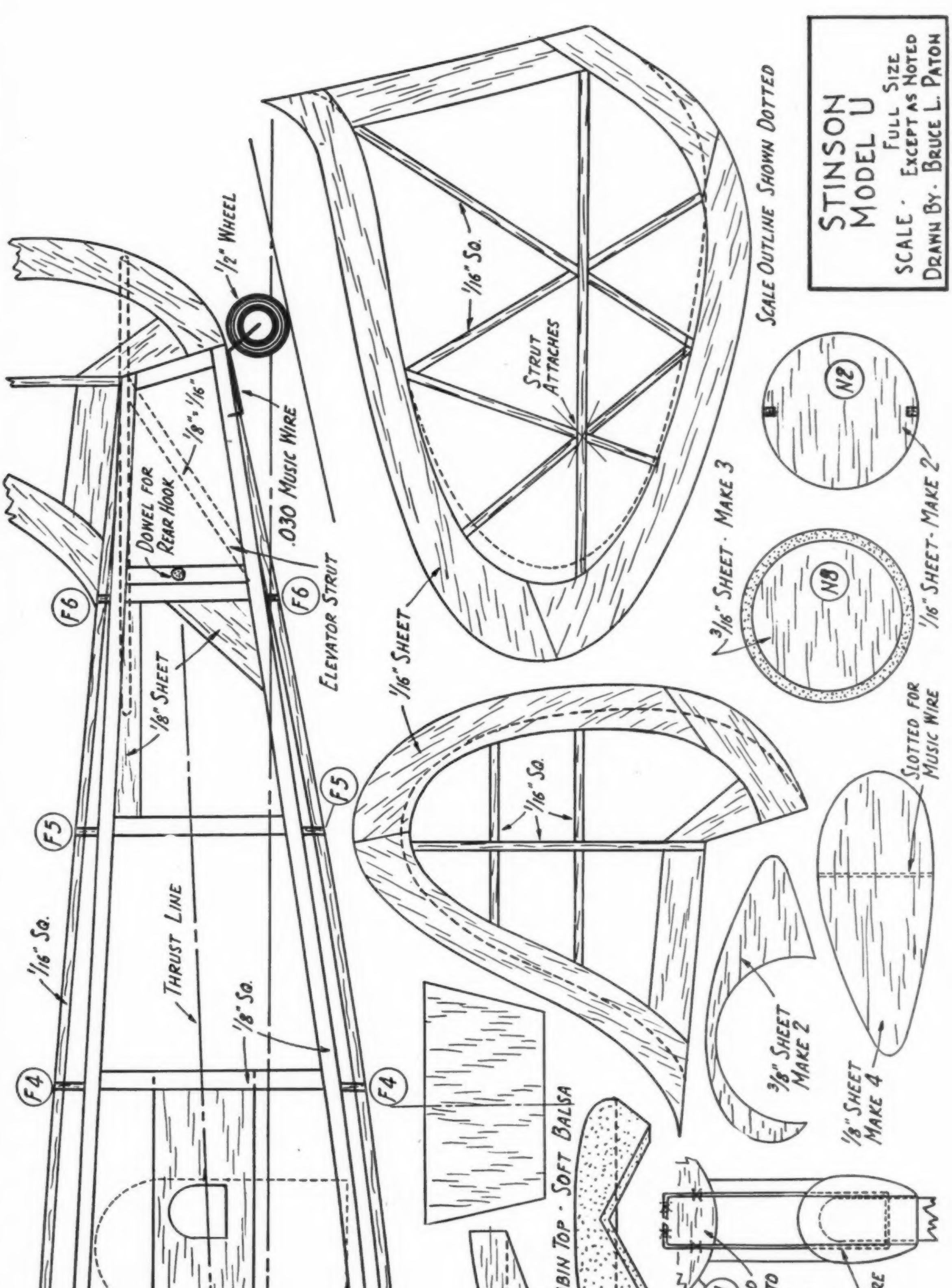
WINGS: The centersection out to and including ribs W2 is constructed first. It should be noted that the 1/16" sq. spars in the centersection are installed two over and two under the top fuselage longeron. This will insure the correct incidence angle. Soft balsa blocks are cemented between ribs W1 and W2 at both leading and trailing edges and shaped when dry. Outer wing panel drawing is enlarged and then reversed to allow building both panels on the plan. Be sure to make four W3 ribs of 1/8" sheet for strut attaching ribs.

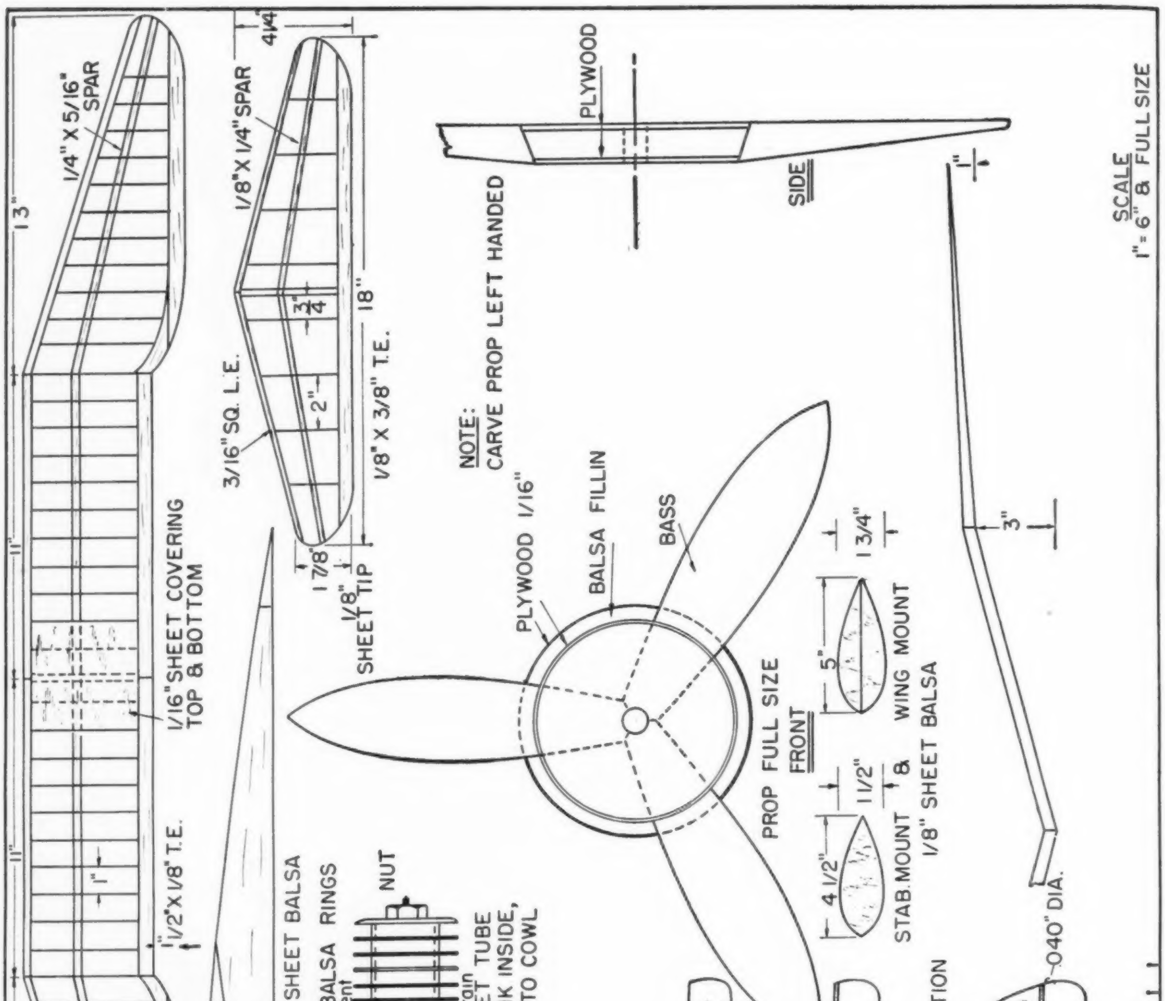
TAIL: Both rudder and stabilizer may be constructed directly over plan as these are flat surfaces. Scale outlines have been shown in dotted lines should you desire to build a non-flying scale model. Note when attaching the stabilizer that it is installed parallel to the thrust line, giving it 0° incidence.

PROPS: Scale props should be made of hardwood. The two outboard props may be left in place when flying and if properly balanced, will windmill, creating the illusion that all three motors are pulling. Good results have been obtained with the flying prop shown. However, if longer flights are desired an 8" diameter single blade folding prop is recommended; this necessitates an increase in length of the landing gear legs for R.O.G. flights.

ASSEMBLY: Cover all components with a high quality of tissue and attach wings and tail to fuselage with a good grade of cement, preferably *Ambroid*. Be sure to remove sufficient paper at strut attaching locations to insure a firm wood-to-wood cement joint. Do not water dope wings until they have been fastened in place, otherwise the tissue will bow the inboard end ribs and make cementing difficult. (*Turn to page* 47)


STINSON
MODEL U
SCALE - FULL SIZE
EXCEPT AS NOTED
DRAWN BY - BRUCE L. PATON
1/4" SHEET MAKE 2
N4
PINE NOSE PLUG
WASHERS FOR FLYING PROP.
N8
F1
1/16" SQ.
1/16" SQ.
1/16" SQ.
1/8" SQ.
F2
F3
1/16" SHEET
THRUST LINE
1/8" SQ.
1/16" SQ.
1/8" SQ.
1/16" SQ.
NOTCH INSIDE OF STRUT FOR MUSIC WIRE
5/16" x 1/8"
1/8" x 1/16"
W1
1/16" SHEET MAKE 2
N7
N1
N3
1 1/8" WHEELS
N5
N6
1/16" SHEET MAKE 2 OF EACH
1/16" SHEET SEE INSTRUCTIONS
N1
1/32" CAP
1/16" SHEET SEE INSTRUCTIONS
N3
W4
1/16" SHEET - MAKE 2
1/16" x 1/8"
W3
1/16" SHEET - MAKE 14
1/8" SHEET - MAKE 4
1/8" SQ.
W2
1/16" SHEET - MAKE 2
1/16" SQ.


STINSON
MODEL U
SCALE · FULL SIZE
EXCEPT AS NOTED
DRAWN BY · BRUCE L. PATON
SCALE OUTLINE SHOWN DOTTED
1/16" SQ.
STRUT ATTACHES
1/2" WHEEL
.030 MUSIC WIRE
1/8" x 1/16"
DOWEL FOR REAR HOOK
ELEVATOR STRUT
1/16" SHEET
3/16" SHEET · MAKE 3
1/16" SHEET · MAKE 2
N2
N8
F6
F5
F4
F3
1/8" SHEET
THRUST LINE
1/8" SQ.
1/16" SQ.
SLOTTED FOR MUSIC WIRE
3/8" SHEET MAKE 2
1/8" SHEET MAKE 4
CABIN TOP · SOFT BALSA
N1
BIND AND CEMENT TO BACK OF FORMER
.030 MUSIC WIRE



13"
11"
11"
13"
6"
1/4" X 5/16" SPAR
1/4" SQ. L.E.
1/4" SHEET TIP
1 7/8"
1/2" X 1/8" T.E.
1"
1/16" SHEET COVERING TOP & BOTTOM
4 1/4
1/8" X 1/4" SPAR
3/16" SQ. L.E.
3/4"
2"
18"
1/8" X 3/8" T.E.
1 7/8"
1/8" SHEET TIP
TIP RIB
WING & STAB. SECTION 1/16" SHEET BALSA
NOTE:
CARVE PROP LEFT HANDED
PLYWOOD 1/16"
BALSA FILLIN
BASS
PROP FULL SIZE
FRONT
PLYWOOD
SIDE
BALSA RINGS
NUT
fill
vent
drain
1/16" SHEET TUBE SLIP TANK INSIDE, CEMENT TO COWL
TANK DETAIL
1-5/8" X 4 1/2" SOFT BALSA
1/4" SHEET HARD BALSA
1/4" SHEET HARD BALSA
1/4" SHEET 2 REQ. SOFT BALSA
4 1/2"
1 1/2"
STAB. MOUNT
5"
1 3/4"
WING MOUNT
1/8" SHEET BALSA
TYPICAL POD CROSS SECTION
1/16" SHEET
.040" DIA.
1/2" DIA.
3"
1"
FIREWALL 1/8" PLYWOOD FULL SIZE
1"
SCALE
1" = 6" & FULL SIZE

The Loafer

by Frank Ehling

WITH the appearance of the *Baby Spitfire*, a dream ship that was designed eight years ago was brought to completion, and there are many other designs that will be able to live now. The design shown here was laid away originally for the reason that transportation of a ship of the required giant size would be out of this world. Back then the only engine was the *Brown Jr.*, which at that time was a "hot 60". How times have changed!

With the *Baby Spitfire* mounted on its side, and a dummy cylinder built up over a discarded lip stick container that serves as the fuel tank, scale appearance was achieved. The single landing wheel can be employed if you want; however it can be left off, if only hand launching is to be used. By use of dye instead of colored dope the weight of your model can be cut down. Trimming was done with *Trim Film*, a new easy out for the modeler who wants his plane to look like a model should, and not as though it had been finished in the dark. Since glow fuel is to be used, the entire motor nacelle and the center section of the wing were coated with hot fuel proofer. Light weight was essential so *Comet* fuel proofer was employed. Later, while flying the model, fuel was accidentally spilled on various other parts of the ship and promptly dissolved the dope thereon. We strongly advise fuel-proofing the entire job; little weight will be added, and the protection is really worth it. By choice of the right grades of wood, the weight of the model was kept to 4 oz.

Start construction with the wing. Cut out the ribs and assemble the wing in four sections, then join with gussets. Leave out the two center ribs until later. Cut the pylon and cement it in place along with the firewall. Then add the side blocks and shape as shown on the plan. Carve the cowl to fit around the engine and cut down a small apinner to match.

The three bladed prop has been found satisfactory; however the extra work of making this can be eliminated by cutting the tips off a larger prop. Mounted as a pusher, you will need a pusher type prop, since rotary valve engines cannot be reversed. If you don't want to bother with carving a special prop, a metal prop will be found convenient, as you can simply bend the blades so they will "push" properly.

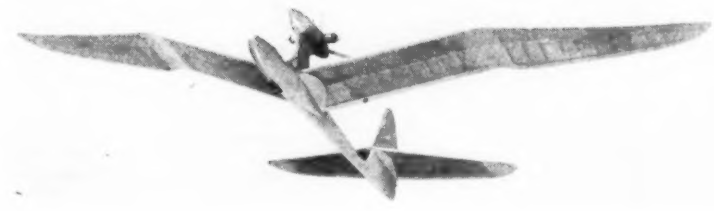
While speaking of the engine we should mention that the dummy cylinder was used as a fuel tank mainly because we were too lazy to hollow out the nacelle and cut through the firewall to allow use of the standard *Spitfire* tank. The rubber tubing between our new tank and the engine looks rather like a manifold and thus enhances the scale effect.

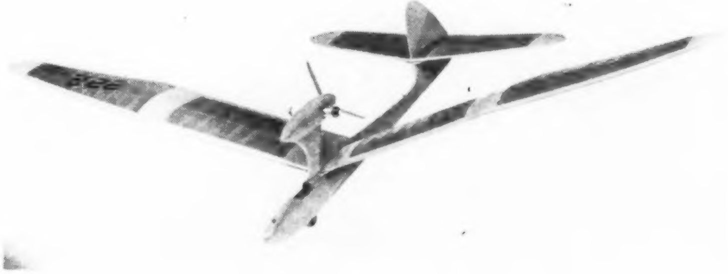
The stabilizer is made in the same manner as the wing. Sandwich a rudder between the two center ribs—this will give a firm job. The fuselage proper is now cut to shape and if the wheel is to be used, cut out the wheel well and fasten the axle in place; be sure to cement well. Slip on the wheel and add a drop of solder to hold the wheel in place.

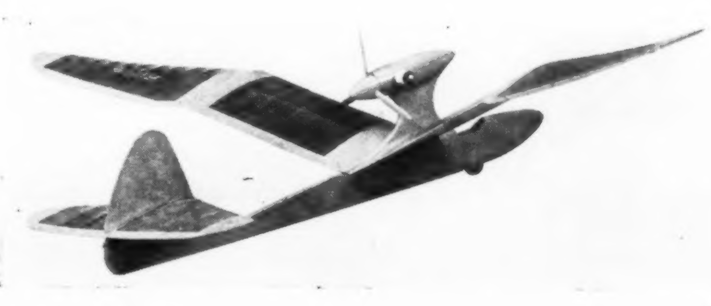
The two pod sides can now be cemented in place and carved to shape. Fasten on the wing and stabilizer supports; it is important to have these strong, since if the wing can shift alignment, successive flights will never be the same.

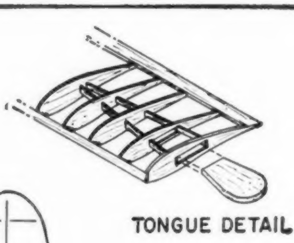
Flying is accomplished in the usual manner; test the ship until the glide is smooth with a moderate turn to the right. Power flights of only a few seconds duration are good at the start, as the model can be trimmed properly, then longer power trials may be made.

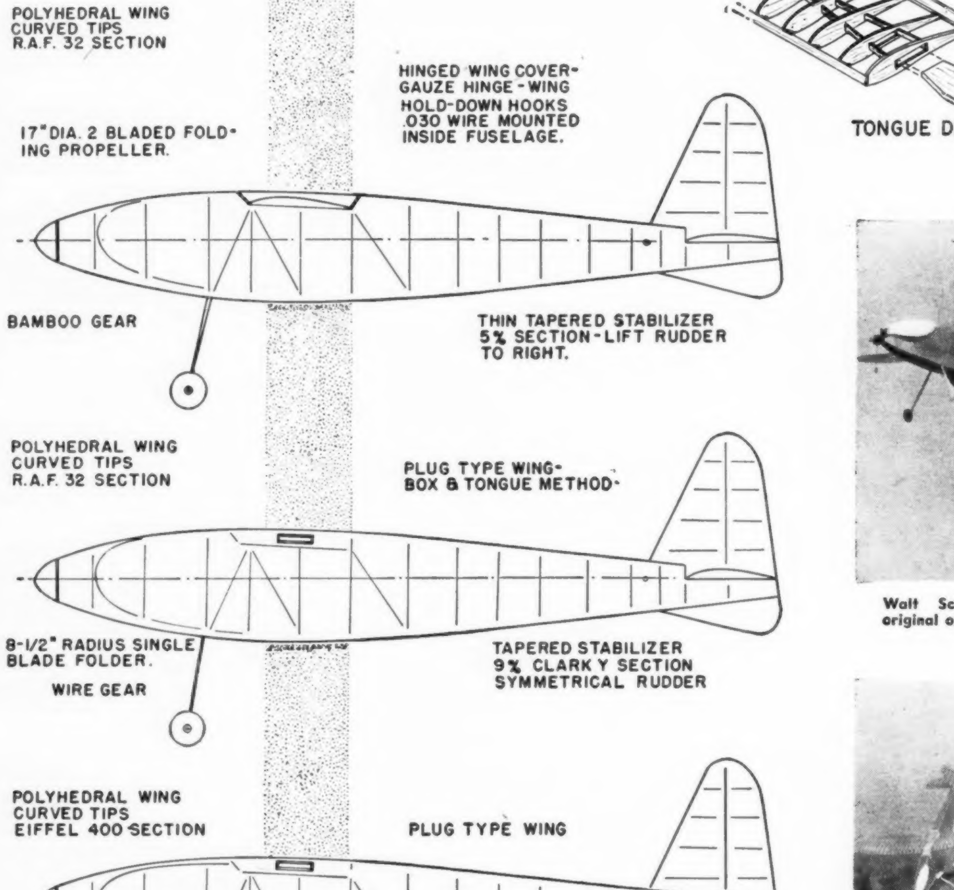
(*Continued on page* 40)











POWER I TO 4: 18 STRANDS, 45" LONG 1/4" T-56

Walt Schroder holds the original or No. 1 model aloft

Bill Winter shows likeness between the No. 1 and No. 2 ships (No. 1 at left)

Eureka!

by Bill Winter and Walt Schroder

IF anyone should ask us which is the most difficult model to properly design, build, and fly, the answer would be a cinch. If anything can be tougher than a Wakefield job, we would like to make its acquaintance! For it required the combined efforts of these two ancient modelers, seven ships, and many weeks of intensive effort over a period of a year to perfect a machine that would do four minutes plus in still air.

If you shoot for thermals, of course, out-of-sight flights usually are easily had. But when the going is tough, it is the machine that is down to weight, properly rigged, fitted with the best power-prop combination, that shades the field. The Englishmen have ships that will do 4:45 in dead air and the rules set a limit of five minutes. Building a sufficiently light but strong machine is a feat of no mean proportions. With an 8 oz. minimum rule, the rubber alone weighs between 3 and 4 oz., leaving but four or so ounces for construction of an airplane spanning nearly 4'. Moreover, these high-powered machines are worthless if the flying surfaces become warped. As a check on performance, a reasonable minimum to strive for is a duration of three times the motor run, as, say 3:45 on a 1:15 run and even that is only a so-so Wakefield flying.

Unlike most development yarns, this story includes the errors and mistakes, as well as the deductions and corrections. Perhaps by putting down the bright ideas, something useful will be contributed toward an airplane somewhere that might "out-Jaguar the Jaguar."

Of the seven airplanes, the last is the *Eureka*, shown in our 3 view. The sixth was an early 1949 modification of the fifth airplane, developed late in 1948. That sixth ship was abandoned as soon as it was finished because drastic measures were required to produce designs capable of standing up to the British in still-air duration. The fifth and the fourth were better than average machines, while the first three were the guinea pigs on which we began to learn how nasty Wakefield jobs can be, so this is their complete story. If we blush at some of the boners, the sting hurts less now that we have put the *Eureka* into the air.

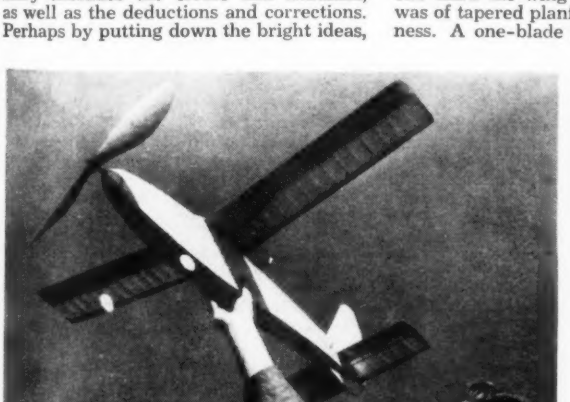
Let's scoot over the first three ships. They were built simultaneously. A shoulder wing design was selected for several reasons. Most important was the fact that the Wakefield rules permit 190 to 210 sq. in. of actual (not projected) wing area, and that approximately 12 sq. in. of this area usually is wasted in attaching the wings. The portion over or on the fuselage gets counted, too. By running the wing through the fuselage, this area can be put into a wing of slightly greater span. Both Eiffel 400 and RAF 32 airfoils were used and wings were swapped back and forth from ship to ship. Limited to one-third the wing area by rule, the tail was of tapered planform with a 5% thickness. A one-blade folder was used with 18 strands of 1/4" flat rubber. Bamboo landing legs were tried to reduce vibration of the wheels, which was considered a drag-producing condition. Ship number one had an airfoil shape rudder to produce a right turn, but this speedily was blamed for a pile-in and washout on an early test flight, for it seemed to become increasingly effective at high speed. Chet Lanzo told us the same thing many months after this crash; then Bob Holland used such a rudder on his third-place finalist last year, though he worked it against offset thrust.

All three early airplanes were miserable busts. Although the builders had flown many rubber jobs, rubber contest models of the Wakefield variety demanded more than a healthy gas model experience. Built right down to the eight-ounce minimum these ships had the perhaps unusual power-weight ratio of 50-50. Naturally, they were too weak structurally to stand the gaff. Fuselages of 1/8-inch square gave way fore and aft of the lading gear attachment gussets and tensioned motors folded the body like an accordion the instant such failures occurred. Wings caught in the shoulder cut-out, despite all manner of modifications to the saddles and the surrounding structure, and broke rather than detached in a crash.

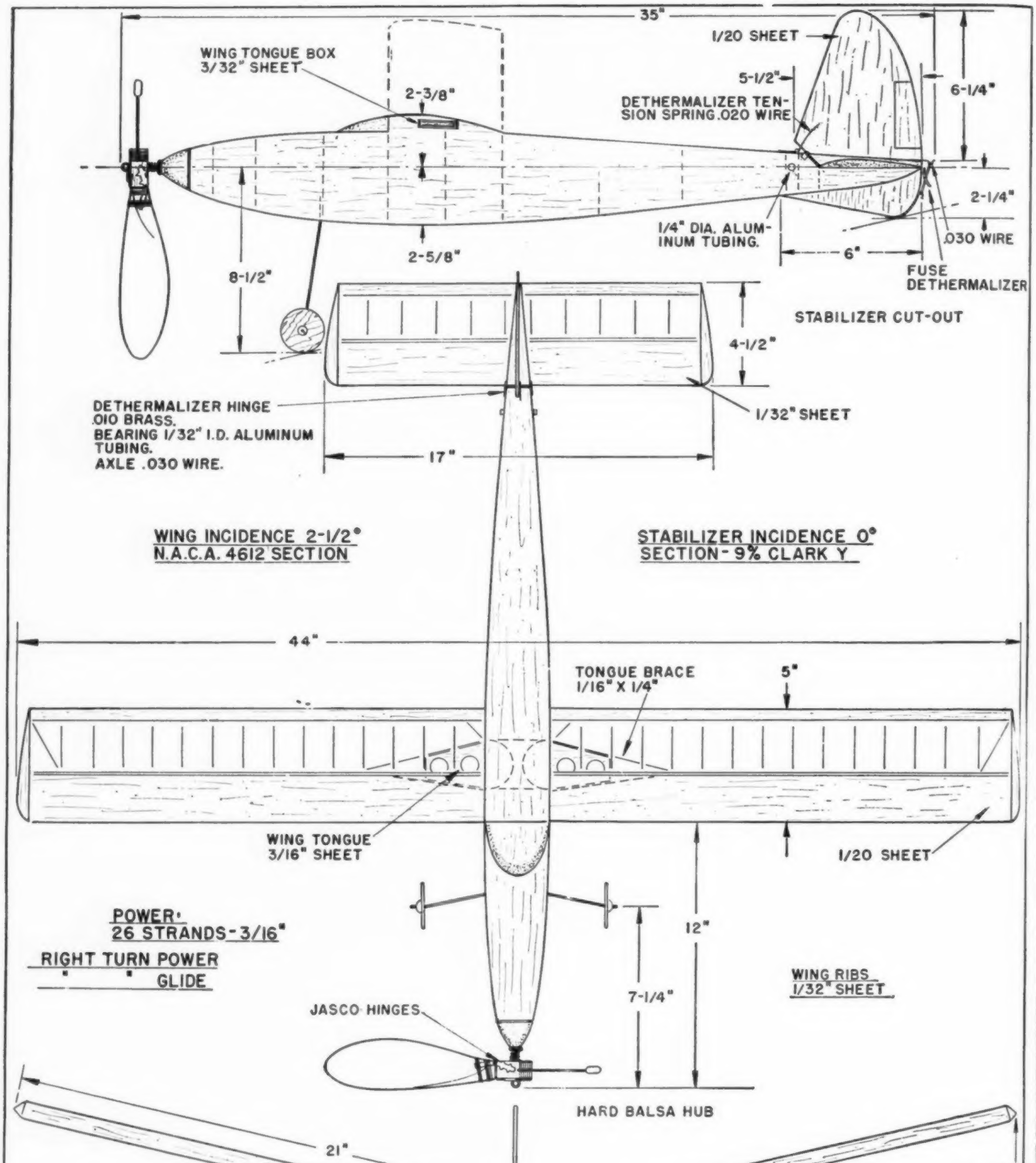
At this point it became clear that structural design can be a fine art. The requirements of an 8 oz. sturdy Wakefield makes one produce or else! You note that as you go from ship to ship, a continual battle is fought to beef up the weak points, swiping a little here and there in weight from other presumed over-strong portions of the airplane. This tight rope act takes you to fantastic lengths.

When ships four and five were built it was hoped they could be flown at the Nationals. A great deal of thought went into the use of materials. For example, the fuselage had to be reinforced from the wing position to the nose on top, and from behind the gear to the nose on the bottom. The wing-position covers obviously were for the birds, being fragile, adding drag by reason of poor fits, and the one-piece wing itself seemed a bad deal. This problem led to adaption of the British tongue-and-box system of wing mounting. Adding some remarkable advantage in durability, this wing mounting still would boost weight further. Weight for these additions was obtained from the

(*Continued on page 36*)



Eureka looks unlike any Wakefield ship we have seen, but it's tops in performance and durability


35"
1/20 SHEET
WING TONGUE BOX
3/32" SHEET
2-3/8"
5-1/2"
6-1/4"
DETHERMALIZER TEN-
SION SPRING .020 WIRE
2-1/4"
1/4" DIA. ALUM-
INUM TUBING.
.030 WIRE
2-5/8"
6"
FUSE
DETHERMALIZER
8-1/2"
STABILIZER CUT-OUT
4-1/2"
DETHERMALIZER HINGE
.010 BRASS.
BEARING 1/32" I.D. ALUMINUM
TUBING.
AXLE .030 WIRE.
1/32" SHEET
17"
WING INCIDENCE 2-1/2°
N.A.C.A. 4612 SECTION
STABILIZER INCIDENCE 0°
SECTION- 9% CLARK Y
44"
TONGUE BRACE
1/16" X 1/4"
5"
WING TONGUE
3/16" SHEET
1/20 SHEET
POWER:
26 STRANDS-3/16"
RIGHT TURN POWER
" " GLIDE
12"
7-1/4"
WING RIBS
1/32" SHEET
JASCO HINGES
HARD BALSA HUB
21"
4-9/16
3° RIGHT THRUST
1° DOWN THRUST
1949 WAKEFIELD
WM. WINTER DESIGN
SINGLE BLADE FOLDING PROPELLER
BLANK: 2"X2"X 10"
9" RADIUS
36" PITCH
1-3/4" DIA. PLYWOOD
WHEELS- HARDWOOD
BEARING.
8"
SCALE 5/32"=1"
SCHRODER

by Charles H. Grant

IF THE present follows the pattern of past years, these warmer days with a breath of spring in the air will quicken the pulse and stir the flying fever of all "dyed in the wool" model fans, especially in the free flight category. Sad to relate there are only a few who, like the fans of past years, recall the thrill of getting out into the open spaces and spending an afternoon of free flying. There is great pleasure derived from this experience that springs from some intangible source and which cannot be duplicated by the more convenient but less ambitious pastime of guiding a model on the end of a wire in a restricted circle. U-control has its place, but it will never serve as a substitute for free flight experience, if the objectives are pleasure and to increase your fundamental knowledge of aeronautics.

The war has robbed the model game of free flight fans because beginners springing up during this period did not have the advantage of free flight training. The experts in free flight were fighting for Uncle Sam and were unable to pass on their experience to the newcomers: U-control flying was more within their grasp, so it became popular. Consequently, a vast unexplored field of design knowledge lies before those fans who have joined the ranks of model builders since 1943. Many of these are becoming interested in free flight, inspired by the glamorous tales of pre-war contests. Many would like to enter contests this coming season, particularly the Nationals, and some are beginning to ponder just what type of model they should fly in order to obtain best results. The most natural inclination is to go to some model store and buy a kit of a so-called record breaker, construct it, and enter it in the contest. With this procedure they deprive themselves of the valuable experience and thought that comes to those who have the initiative to *design* their own planes; advantages which stand them in good stead when it comes to flying in a contest, because few win contests who do not know something about the plane they are flying and how to adjust it. Creating your own design provides intimate knowledge of the plane and its operation.

Let us assume that you are the type that wishes to stand on his own feet and have the thrill of bringing home a trophy won by your own creation. Your first problem is to choose the type of model that you believe will give the best results. If your experience is meager, there is great advantage in considering the past. Will you be impressed by the high wing, low thrust line type of pylon model so popular today, or will you examine the record more carefully? It's true pylon models win most of the contests today because 95% of the models flown are high wing pylon models. Without careful consideration model builders have accepted these as the best type to fly. They reason, if they are not the best, why are so many flown? To know the answer, it would be necessary for a fan to have had intimate model experience during the years following 1935. During those years all types of models won contests and flew as well as the pylon type. However, one successful manufacturer realized the advantage of manufacturing models in quantity. He was a pylon manufacturer and the market was flooded with this type of plane. Those who wished to enter the contest and went to some hobby shop to purchase a kit, had little to choose from except parasol wing, low thrust line, and pylon models. This particular type also had the advantage of rules that favored this type of model, especially in respect to the power-weight ratio of the pylon models then available. This feature rather than the pylon design made the type an outstanding winner, and it became extremely popular. Today, however, flying rules are different. There is no limit to wing area and much of the advantage of the high-powered low-weight model has been transferred to those with greater wing area.

Now the question immediately arises—if not pylon models, what type shall we build? Again the past tells us a vital story. Perhaps some of you will remember the names of famous record holders, Leon Shulman, Sal Taibi, Russell Simmons, B. Noble, Bob Long, Joe Kovel and many others. All of these broke records with models that were not of the well-known high pylon, low thrust line type. Those who attended the 1940 National's at Chicago would have seen Leon Shulman walk off with first place and a beautiful trophy with his famous *Wedgy* model. Leon took the C.L.A. theory seriously, applied it to his ship and won world-wide fame. A side view of this ship is shown in Fig. 1. It not only has the advantage of a low C.L.A., but it also has more area forward, which prevents the nose from dropping during turns. This ship was so stable that in climbing it performed an outside spiral, unlike the pylon-type model which climbs in an inside spiral (during an inside spiral the top of the wing faces the axis of the spiral). The *Wedgy* design flew with greater consistency than any model at the Nationals. It not only climbed like a rocket, due

(*Turn to page* 54)

CHARLES H. GRANT

Charlie Grant started his aviation career in 1909 as a member of the New York Model Air Club. Built man-carrying glider in 1910 and another in 1911—latter lasted for five years. President of Princeton Air Club, 1917; enlisted in Air Force and was sent to Kelly Field. Transferred to M.I.T. and graduated as Engineering Officer, then went to Washington as aero designer until 1919. Next, organized model plane mfg. company, developed machine to produce finished model props in large quantities. From 1921-1930, Charlie operated a boys' camp in Vermont; model aviation was featured, of course! Associated with Chance Vought Airplane Co. and other model and big plane concerns through 1945. Became Editor of M. A. N. in 1931 and retained this post until 1943, when ill health forced a rest. He holds many U. S. Patents on model and full size plane elements. Was instrumental in popularizing gas-powered modeling. Has written and had printed over 500 articles on aeronautics. Data collected over 30 years of model research culminated in his book MODEL AIRPLANE DESIGN AND THEORY OF FLIGHT, the standard textbook of model aviation. Charlie is still active in aero research and expects to be for many years to come.

design forum

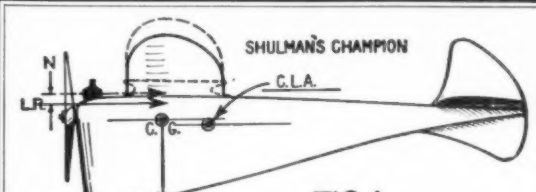


FIG. 1

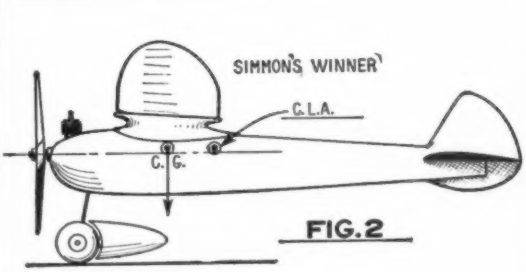


FIG. 2

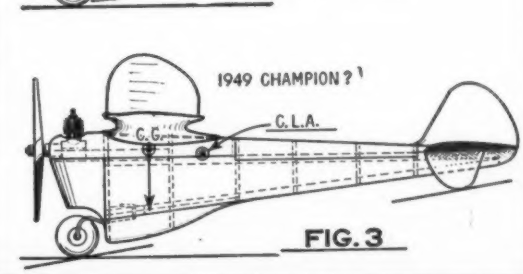
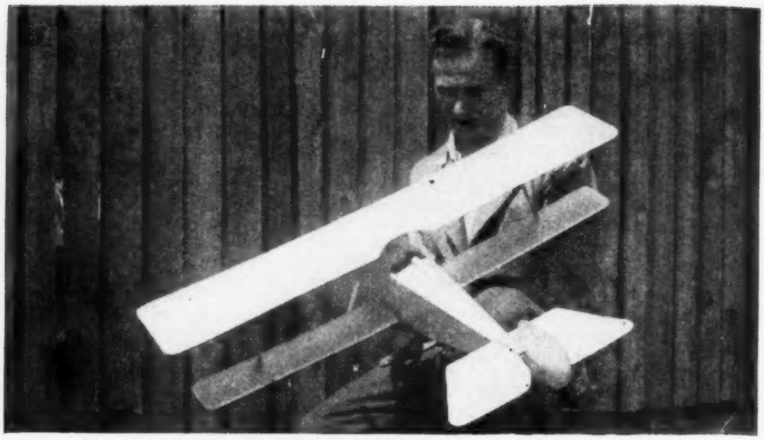


FIG. 3

No. 1 Joan Walker holds her plane *Skeeter*

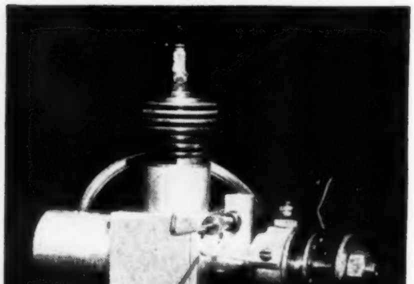


No. 2 D. A. Moller holds his free flight diesel-powered Nieuport 17 biplane

No. 3 *Flea* glider and proud builder R. Dobbs

No. 4 Cliff Adam, well-known Australian band leader, with contest winning original design

Air Ways



No. 5 *Another* successful *Simplex*, by R. Piziali

TEAM RACING has become so popular that an AMA committee has been appointed to study this activity and coordinate rules and reports on the subject. The Committee is composed of Keith Storey of Pasadena, Calif., Walter ("Brad") Thomas, High Point, N. C., John S. Young, Hagerstown, Md., and Bill Winter, Kent, Conn. If your club or group has tried Team Racing, why not write to the Committee member located nearest you, and tell him your experiences, recommendations, exact rules used, etc.

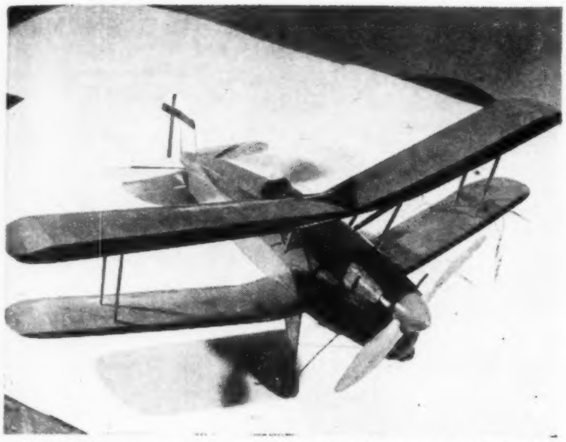
ANOTHER NEW IDEA for a special contest comes to light. This one was held at Coeur d'Alene, Idaho, on March 6; entrants were required to fly their ships 250 continuous laps or better to become eligible for a place. Since the mercury was only slightly above zero, this was an endurance contest in more ways than one! It was found necessary to carry at least a pint of fuel, and the winner, Radford Hall, finally attached a 1-1/4 pint tank to his model. His *McCoy 19* powered ship had no trouble taking off with this extra weight, however, and the winning flight of 587 laps took 1 hr. and 10 min. of continuous flying. This, we claim, took real endurance, both for engine and flier!

* *

No. 1, our first picture this month, shows Joan Walker (719 Hickory St., Niles, Mich.) holding her initial attempt at a controline plane. Her brother, John, who sent us this photo said that the only help he gave was in bending the landing gear and wiring the ignition system. He also provided the *Atwood Champion* engine. After all her hard work, Joan wouldn't take a chance on flying it and the first flight was made by a friend. Unfortunately, the push-rod came loose and the flight was terminated abruptly. Joan repaired the damage but moved shortly out-of-town thereafter and could not take the plane along. Brother John took the ship to a nearby contest and won third place with it in the stunt event.

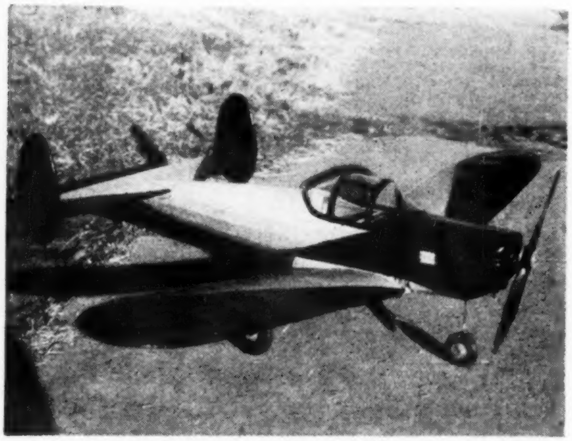
In picture No. 2 we see something rather unusual, a free flight gas model of the famous Nieuport 17. This World War I beauty, which has proven to be a very fine flier, was produced by D. A. Moller (12 First Close, West Molesey, Surrey, England). It is powered by a *Mills* 1.33cc diesel engine with a prop made by Mr. Moller, who is holding the plane in the photo. Among his other modeling activities, he is head of the local *Molesey Model Aircraft Club* and writes that he and his club members would like to get in touch with some American pen pals. He would be very glad to exchange plans of the Nieuport 17 and many other ships for plans of American designs.

Roland Dobbs (104 Ramapo Valley Rd., Mahwah, N. J.) shown holding his Class "E" towline glider in photo No. 3, has found this design to be the best of its type that he has ever built. The glider is the *Flea*, plans for which appeared in the September '48 issue of MODEL AIRPLANE

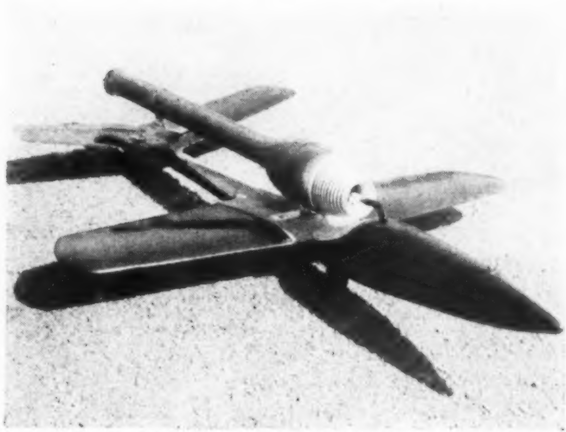


No. 6 Ohlsson-powered *Jungmeister*—a fine flier says Gordon Dent

No. 7 Barrie Reed has equipped his *Kid* with a pair of floats



No. 8 *Ercoupe* will be converted to U-control by builder McMullan



No. 9 Glen Sundaland has had good results from this Dynajet speedster

NEWS OF MODEL AIRPLANE EXPERIMENTERS ALL OVER THE WORLD

NEWS. Roland feels that Don McGovern designed a real winner in this case and would like more such fine plans in future issues. At the time the picture was taken he had reached a top time of 11 min., and had to chase the plane 4 mi. to get it back.

That unusual chimney sticking up from the front of the motor in picture No. 4 is there for a definite purpose. This model is flown in very sandy territory and the long rubber tube on the intake pipe has been found to keep sand out of the motor. Holding his original design plane is Cliff Adam, popular dance band vocalist, and an ardent model flier. Cliff is often called the Crosby Australian and we are indebted to A. J. Hull (Box 13, Mornington, Victoria, Australia) for this photo.

Another highly successful *Simplex 25* engine is shown in photo No. 5. It was built by Ray Piziali (24780 Audrey Lane, Detroit 19, Mich.) who has found it exceptionally easy starting and a pretty good performer. When the photo was taken, the engine had never been in a plane but Ray intended to put it in a *Playboy Jr.* The only changes he made from the original plans were to install a bronze bushing for the crankshaft, and he also extended a threaded stud on the forward end of the crankshaft, instead of using the screw arrangement specified on the original plans.

Another ship built from MODEL AIRPLANE NEWS plans is shown in picture No. 6. This is the *Jungmeister* which appeared in our January '48 issue. This ship is powered with an *Ohlsson 23*, and though Gordon Dent (630 Park Rd., Redwood City, Calif.) had a bit of trouble with the original plans because of the fact that they were in 5/16" scale, he was very much pleased with the results of the finished product.

Still another M.A.N. plan was used by Barrie Reid (13 Alexander St., Wanganui, New Zealand) to produce the *Kid* which is shown fitted with floats in picture No. 7. Mr. Reid has powered this model with a compression ignition engine built in New Zealand. This engine has a displacement of .12 cu. in., weighs 4-1/2 oz. complete and produces about 1/6 hp. at 7500 rpm. He states that the standard fuel used by most of the fliers in his country is composed of 55 parts kerosene, 30 parts S.A.E. 60 oil, and 15 parts ether. As has been the case with other model builders who fly their planes over water, Mr. Reid considers the diesel ideal for this form of operation since in case of a crash landing there is no electrical system to get water soaked.

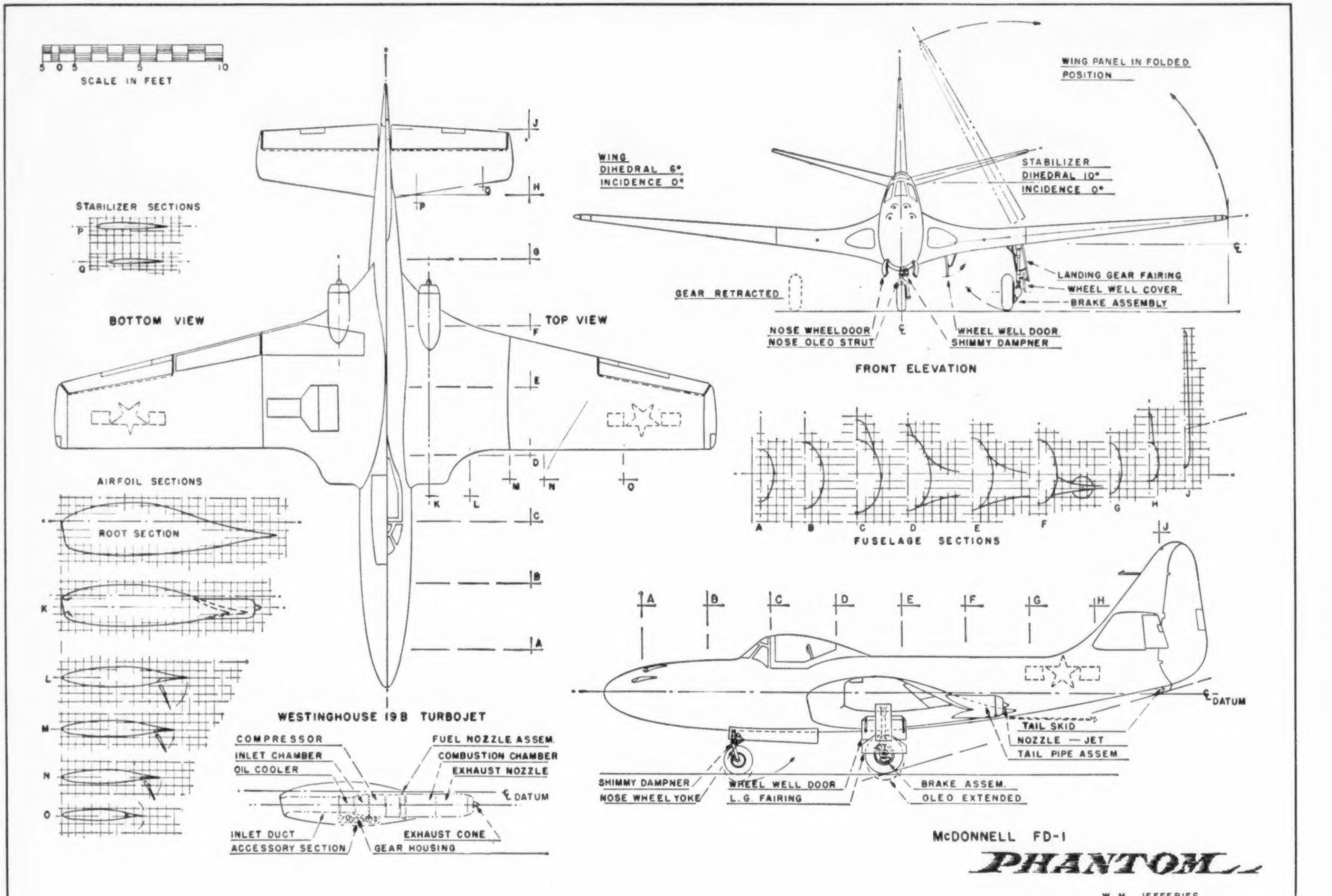
Jimmy McMullan (Box 163, Nashville, Ark.) who sent us the picture No. 8 of his *Ercoupe* made from plans in our March '43 issue told us practically nothing of his ship except that he expects to convert it to U-control operation.

The jet boys are represented this month by photo No. 9 sent in by Glen Sandaland (1168 Winchester Ave., Glendale, Calif.). This speedster was built from plans of

(*Turn to page* 50)

No. 10 *Voodoo*, a stunt job by E. Campana

No. 11 Gil Minnigh's B17 has 17" wingspan


SCALE IN FEET
BOTTOM VIEW
TOP VIEW
STABILIZER SECTIONS
AIRFOIL SECTIONS
ROOT SECTION
WING
DIHEDRAL 6°
INCIDENCE 0°
STABILIZER
DIHEDRAL 10°
INCIDENCE 0°
WING PANEL IN FOLDED POSITION
GEAR RETRACTED
LANDING GEAR FAIRING
WHEEL WELL COVER
BRAKE ASSEMBLY
NOSE WHEELDOOR
NOSE OLEO STRUT
WHEEL WELL DOOR
SHIMMY DAMPNER
FRONT ELEVATION
FUSELAGE SECTIONS
WESTINGHOUSE 19B TURBOJET
COMPRESSOR
INLET CHAMBER
OIL COOLER
FUEL NOZZLE ASSEM.
COMBUSTION CHAMBER
EXHAUST NOZZLE
℄ DATUM
INLET DUCT
ACCESSORY SECTION
GEAR HOUSING
EXHAUST CONE
TAIL SKID
NOZZLE — JET
TAIL PIPE ASSEM
SHIMMY DAMPNER
NOSE WHEEL YOKE
WHEEL WELL DOOR
L. G. FAIRING
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Silkspan GM	.10
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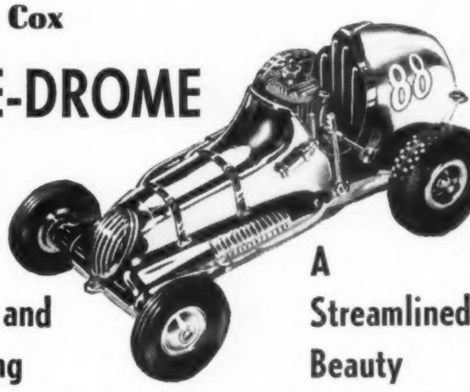
CRESCENT PICK-OF-THE-MONTH

Famous Roy Cox

THIMBLE-DROME RACERS



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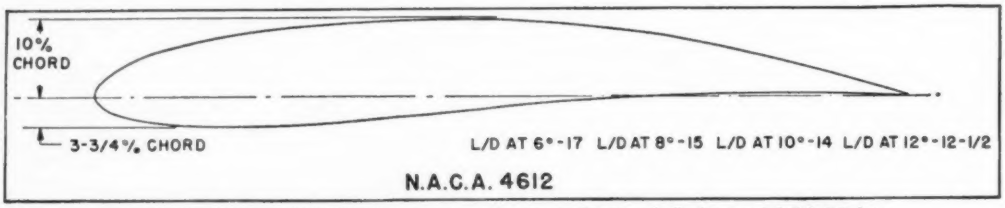


Here is the "Mystery Airfoil"—this is exact size for use on Eureka. Ordinates are tabulated below.

Eureka!

(*Continued from page* 29)

only place possible and that was wing and tail. We were compelled to go to hollow spars in both wing and tail. Both these features deserve attention.

The tongue-and-box enabled one airplane to outlast two to three of the old machines. The wings never fall out, as one might fear, and always knock off easily against objects, saving the panels, if not the airplane. The *Eureka* itself has had crashes with trees, buildings, rocks, etc., and has come through collisions that any modeler would have to see to believe. When your pet ship buzzes into a tree, leaving wings behind to flutter to the ground, rather than tear the whole business to pieces, you appreciate this clever idea from across the sea.

Frankly, we pilfered the idea from the writings of Ron Warring, British Wakefield expert. As the sketch shows, the tongue is built into the wing and its rounded ends fit into a box inside the fuselage. On airplanes of this size the dihedral is always put into the tongues, not the box. The box itself must be bound with silk or thread. One must be careful to get identical dihedral and incidence angles in each panel. As the tongues wear loose, they are rubbed with chalk to build up the fit; we adjust ours by means of rough paper shims glued to the proper portion of the tongue. Oddly enough, the only severe strain seems to result from one of those dead stall landings, where the ship plops onto its gear; the deadweight of the wings then will open the box if it is faultily made and not bound for rigidity.

As for hollow spars, it was found that unbelievable lightness with strength could be obtained. Each panel of the wings on ships four and five weighed in at a shade over 1/2 oz. The spars were made from 1/32" sheet, as were the ribs, and the trailing edge was only 1/16" x 1/4" hard balsa. By putting the spars through the centers of the ribs, the covering of the wing carried a large part of the load under tension, and the feather-weight wings stood up in the windiest flying and zooms. It was the beefed up fuselage that continued to fail.

These somewhat ungainly boxes displayed possibilities. The glide was truly remarkable, the ship coming down at such an angle that contact was made almost in a three-point position. On down wind landings the ship never turned over. On 20% turns in the motor, a minimum of seven fairly wide gliding turns could be had before the ship touched earth. Power was tremendous, the airplane racing off in a wide left power turn, at a fairly low angle, to reach much better than average height—but there was a rub.

Both of us had been sold on a left thrust, right rudder adjustment through gas modeling experience. Such an arrangement keeps a ship in a tight circle; it will come back into the wind again and again, without racing down wind. But, a rubber job is not a gas job. Slipstream from that huge chomping propeller is a different dish from gas flying, and its interplay with torque is a complicated matter. For example, after the letdown of doing nothing at the Nationals, experiments were made with a 150 sq. in. job which had proved its ability to go left or right under its normal power. An oversized prop and engine was installed. Would torque take it left? Definitely no! With so much left rudder that the ship would spin in the glide, and no offset thrust, this ship would lean over on its right side and race like fury! Slipstream?!

As 1948 came to an end, we had nothing but loads of experience to show for five airplanes, yet plans were made to build a modified version for '49. The wings would be retained as was, with the Eiffel 400, which had shown up so well, but thin sheeting would be added to the leading edge to prevent failure of the covering and give a uniform entry shape to the airfoil. The stab would be changed from a taper to a parallel edge since the old stab was considered a factor in the abrupt stall characteristic of the old machine. The longerons would be 5/32" squares, and

N.A.C.A. 4612		
STA.	UPPER	LOWER
0	-	0
1.25	2.26	-1.57
2.5	3.13	-2.16
5.0	4.36	-2.81
7.5	5.27	-3.17
10	6.02	-3.40
15	7.17	-3.56
20	8.01	-3.50
25	8.60	-3.31
30	9.01	-3.00
40	9.36	-2.27
50	9.18	-1.41
60	8.56	- .56
70	7.44	.10
80	5.66	.40
90	3.23	.31
95	1.77	.14
100	—	0
ORDINATES		

crosspieces would be brought closer together. The leading edge section of the stab would be sheeted to eliminate frequent breakage in crack-ups. An 18" free-wheeler would be installed, largely because the British record at Akron suggested that free-wheelers were not such causes of drag as commonly supposed. It is a fact, too, that a free-wheeler has a dampening effect on stalls, which otherwise build up with a folder. Free wheeling props are simpler and easier to handle on those wing-tip, prop-tip Wakefield launches. When it became evident that weight would go up, further studies were made, and these highlighted the fact that weight could be saved by cutting into the profile, making a more compact fuselage.

This in turn suggested that the whole airplane might be made more compact, keeping the same surface areas, but thus reducing surface or skin friction. Overall length was dropped from 37-1/2 to 35", making a reduction is fuselage cross section as required by the rule-Length Squared over 100.

From the experience of *Supersonic Slim* February '49 (MODEL AIRPLANE NEWS), it was known definitely that sheet balsa could be used successfully for the fuselage. Medium 1/20" thick sheet was used for the sides, butt jointed for width. Two very -light re-enforced bulkheads keep things square, one at the gear, the other beneath the box position. Uprights of 3/32" square are glued to the inside faces of the sheets, and the same material supplies the crosspieces that hold the sides together. Top and bottom sheets fit over the structure and are trimmed off when the cement sets. The nose is re-enforced inside with pieces of 1/16" thick sheet. The secret of avoiding breaks is to use a mixture of castor oil and dope for coating all surfaces. This coating was applied to the entire inside of the fuse before it was sealed, and then to the outside. Use about a half teaspoonful of castor oil to 2 oz. of dope.

The wings and tail surfaces are light and absolutely warp proof, their construction being developed quite by accident. A la the *Jaguar*, it was decided to use a very light top and bottom spar to the wing. When finished, these wings warped frightfully before covering and to salvage them, each panel was fastened to the bench while light sheet balsa was glued to the backs of the spars, for the full wing depth, between the ribs. This eliminated the warps and produced a rigid structure when the leading edge section was covered with 1/20" sheet both top and bottom. As usual the weight had to come from somewhere, so all the ribs were punched out with a pencil top for lightening holes, 4 per rib. The leading edge was reduced in size for still more weight saving. Three tenths of an ounce had been saved on the fuselage, so we still were ahead of the game. The stab was made in the same manner, but the rudder was built from 1/16" sheet, well plasticized with the above concoction.

Flying began with a monster 19" two-bladed fan with 36-inch pitch. Eighteen strands of 1/4" flat made the ship perform more like an indoor model—sometimes almost getting down to the ground on a fantastically long motor run—but we had new problems galore. It was apparent that the higher-pitch bigger diameter prop would enable us to handle the ship fully wound under power, right or left, whereas last year's airplane was a bundle of dynamite at 50% turns and up, but we had traded old problems for new.

The power flights began well enough,

Prepare Now For The Nationals
See Pg. 43

the ship climbing nicely to the right but then she would edge up toward the stall, rolling the left wing down at the same time, and the glide was stally. In cutting down the '48 airplane, the C.G. had moved and, for the stab thickness used (5%), the airplane could not be controlled without plenty of incidence under the leading edge of the stab. Such an arrangement always reduces resistance to stalls, and increases the speed and severity of the stall when it comes, so a thicker tail was decided upon. A handy full-Clark Y stab was attached. Now the ship would glide well but more troubles appeared. At high speed, as in dives from a stall, or if racing down wind, the ship would fly flat because of the effectively working stab, or actually continue the dive into the ground. The wings came back 1/4"; a new tail, a 9% Clark Y, was made.

The rolling under power seemed due to torque of the big prop; the pitch obviously was poorly gaited to an airplane flying slow in the climb. A new prop with 31" of pitch was installed, and the diameter was cut down. Because free-wheelers are forever getting broken in this type of flying, hinges were installed so the blades would fold under impact for test flights. When a hinge broke, one prop was converted into a one-blader. Now the ship really began to move, although the new prop seemed to revolve much slower than the two-blader. Finally, we arrived at an 18", one-blade 36" pitch folder. How we came to do so was another fluke. Once when the ship was free-wheeling from high up, the prop jammed and the wind blew back the blades. The glide immediately flattened out, and tightened up to the left. Whenever the prop would free wheel a few revolutions, a definite braking effect was noted. Out went the free wheelers! As Korda says, "Heaven help us if the British ever discover the folder."

Perhaps a few facts found by much experimentation with *Eureka* will prove interesting. First of all it uses an airfoil never before tried on a model, at least as far as we know. It's an NACA section of a different series from the famous 64 sections (such as the 6409 as used in gas) but of the same family, and is 12% thick. It seemed to us that if a ship is flying at the edge of a stall, particularly in the glide, the proper airfoil should have the maximum L/D at high angles. Who cares about low angles? This section, having more lift than the thinner 6409, still has a superior L/D and comparable drag at angles of 8, and 12° (the only two samples studied). The plane is able to hover at high angles of attack under power.

It should be realized that airfoils with a datum line running through the leading and trailing edges automatically have several degrees incidence when you place them "flat" on the fuselage. To this initial incidence we added another 2-1/2°, after experiments all the way up to a total of 8° positive. With straight dihedral and the 18" prop, the dihedral angle was upped to a minimum of 12-1/2°. Any less, and the ship rocked in a climb, or dug in on turning into the wind at high speed. One degree down thrust and 3° right for the prop worked best, and this ties in with general experience. A 9% thick tail was found precisely right with thicker and thinner sections giving instability. Final power was 26 strands of 3/16" flat.

Probably the most encouraging results of all come from the durability of the wood fuselage. When the breaking rubber blasted out two huge holes we continued to fly; on another occasion when the ship flew through trees, leaving the stab, with the rear of fuselage attached, 40' in the air, we glued the sections together and resumed flying 1 hr. later. The ship had to be retrieved from swamps, the wings rescued from a brook, hunted for after vanishing into a fog, patched and re-patched after innumerable bofs and collisions with posts, bushes, chicken houses, trees, wires. When you can launch an airplane and not worry too much about where it goes and what it hits, brother, you have something! It power-spun vertically into a marsh; we don't guarantee it will stand up under such indignity on a concrete runway, but then, what can?

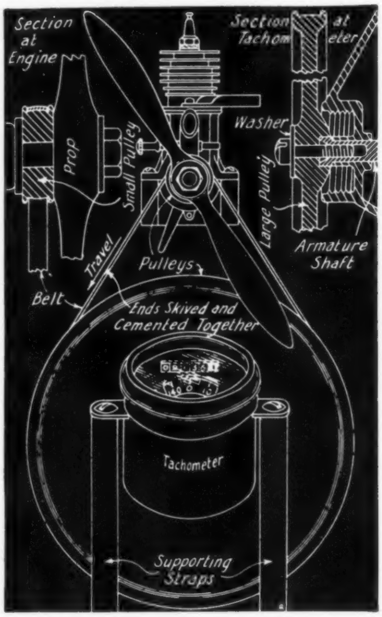
One thing bothers us. Although the *Eureka* has been carefully timed in a light drizzle for an average time of about 3 min. on 5/8 max. winds, we can see a still better airplane. The wing should be raised very slightly, say 1/4". At high power she races a bit still, then noses up more and more steeply late in the climb, sometimes stalling slightly to set up an oscillation of stalls all the way down, although control of the turn gives us nice results. By raising the center or resistance of the machine there will be more nose up force which can be countered with down thrust at the beginning of the motor run, then, when power and speed die, this moment will lessen somewhat, leaving the down thrust to control the latter stages of the climb. It is possible to round the nose, hiding the wire works within a spinner. This has its practical as well as aerodynamic advantages, for bent shafts are one big pain in the neck. The wheels might be converted to retracting gear, although the disadvantages may outweigh the advantages. Polyhedral should be tried as a final check to see if a more reliable transition from power to glide might be effected. Constructionwise, the forward portion of the fuselage might be silk-covered to prevent twigs, etc., from punching holes in the wood. By joining of top and bottom spars with 1/32" sheet facing, these spars can be reduced to 1/16" square for weight savings. At present, the *Eureka* will weigh in at 8 oz. if carefully built.

It is gospel that this 75% wood airplane has outlasted five fully-built-up machines in the amount of abuse it has absorbed. If anyone has questions or comments we'll gladly acknowledge them.

TACHOMETER FOR MODEL GAS ENGINES

by RAY RUSHER

A HANDY instrument for checking the RPMs of a model gas engine is a *Strobotac*. (See March '49 issue.) They require no mechanical connection with the engine and, therefore, impose no load on it. Instead, a flashing light intermittently illuminates the prop so that if the frequency of illumination is coordinated with the RPMs of the prop, the prop apparently stands still. The frequency is manually adjusted by turning a graduated dial so that when the prop appears to stand still, the indications on the dial can be read as RPMs of the engine.



Unless the engine runs steadily it is quite a trick to keep the *Strobotac* adjusted in step with it. The investigative type of modeler with a limited pocketbook can make a satisfactory tachometer from a bicycle speedometer that costs about $5. If you are as lucky as the author, you will be able to pick up a war surplus speedometer graduated in kilometers for 75c. Either type has a speed per hour dial and a "trip" odometer.

To adapt the speedometer as a tachometer, remove the "works" from the casing and note the construction. You will find an armature shaft which is driven by a flexible shaft that extends from the wheel of the bicycle or other vehicle. An armature in the form of a C-shaped permanent magnet is mounted on this shaft and constitutes a miniature electric generator in conjunction with a rotor, which is simply an aluminum cup. Current is generated by the rotating magnetic field resulting from turning the armature; this field sets up a drag that causes the aluminum cup to follow the armature revolutions, but the action of a hair spring tends to return the cup to zero position.

The armature shaft has a worm thread that co-acts with a worm gear on a countershaft. The countershaft has a worm thread meshing with a worm gear on the first tenths odometer dial. By counting the worm teeth, the revolutions per mile or per kilometer can be determined by multiplying the number of teeth of one by the other. In the author's speedometer the count was 25 teeth for each worm gear, which indicates 625 revolutions per kilometer. To determine the RPMs, 625 was divided by 60, the answer being 10-5/12.

The specific speedometer being described had a scale extending to 140 kilometers per hour. It was decided that this could represent 14,000 RPM. Therefore, by multiplying 10-5/12 by 9.6, the answer (100) indicates the possibility of gearing the armature shaft down 9.6 to 1 in relation to the engine and reading the numbers on the dial as RPMs multiplied by 100.

The hookup from engine to tachometer was made by a flat leather belt, 1/16" x 1/4" in crossection, and a pair of wood lathe-turned pulleys. The pulley at the engine shaft was 1" in diam., and at the tachometer a 9.6" pulley was used. The sectional views show suggested connections of the pulleys to their respective shafts.

To test the two pulleys for accuracy of ratio, they are belted together. The small pulley should rotate 9 revolutions plus 216° to one revolution of the large pulley. If the ratio is off, reduce the diameter of one pulley in small increments until the correct ratio is had.

To minimize load on the engine, remove the countershaft of the speedometer so the odometer does not register. The author reconnected the odometer for one engine which he was "running in" in order to determine at all stages of the run-in period the total number of revolutions the engine has made. The kilometer and tenths readings, of course, were multiplied by 625 to arrive at the total revolutions.

The Loafer

(*Continued from page* 27)

If you use a metal prop as suggested above, you can bend the blades to obtain almost a flat pitch to start your power tests. Then, as adjustments are perfected, gradually increase the pitch until the motor is producing full thrust.

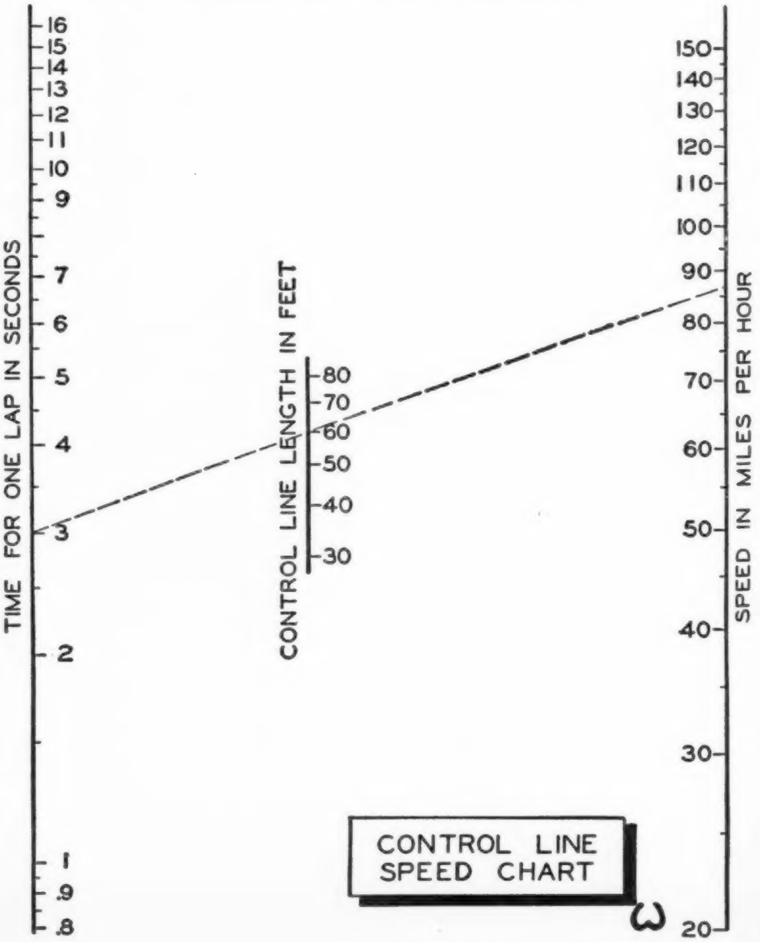
We call this model the *Loafer* because of its smooth graceful flight. You will not get a screaming climb with this job, but if you want a sport ship that will give hours of pleasure, and one on which you will probably never have a broken prop or an engine damaged by crack-up or collision, the *Loafer* is your plane.

SPEED NOMOGRAM

by John M. Klover

THE nomogram reproduced herewith will enable the controline flyer to figure his speed with the use of a simple straightedge of any sort. It includes figures for any length of line in common use, so it is practically universal in application.

To use, just lay the ruler or other straightedge across the left and middle columns and read the speed directly from that on the right. The example shown by dotted line covers a model that makes one lap in exactly 3 seconds on a 60 ft. line. Its speed is then about 86 mph.



Speed Trainers

(*Continued from page* 11)

a different mounting lug, and that the lug must be modified to clear the engine crankcase. The basic difference for installation purposes between the two types of engines lies in the mounting lugs.

The engine is attached by machine screws to the engine bearers, which in turn, are attached to the basswood shell by means of wood screws. Refer to Sheet No. 2. The dural engine bearers are formed to the desired fuselage profiles and must be made right and left hand. Each part should be identical and jig drilled for accuracy. The engine bearers also function as forward fuselage stiffeners.

ENGINE INSTALLATION. In order to reduce the frontal area, a minimum of clearance around the engine is maintained. The engine cowl fits close so that cooling air circulates about the cooling fins on the cylinder with a decreased volume but at an increased velocity and thus achieves a higher rate of heat dissipation. Induction of the cooling air is by means of openings in the engine cowl forward shell. The exit opening is at the aft end of the cowl and is a slit not greater than 5/32" wide. The cooling performance during flight and also during engine run-ups on the ground has proven satisfactory. In fact, when using racing fuel, no excess charring of the surfaces adjacent to the engine on the interior of the engine cowl has been evident. The interior of the engine cowl is sanded to a slick finish to reduce interior turbulence in the air flow. On the *McCoy* installation, the cowl exit is not swept backwards as much as on the *Hornet* installation, the smaller slot area being found sufficient for cooling purposes of the *McCoy 49*.

FUEL TANK INSTALLATION. The fuel tank has a capacity of 3 oz. of fuel. (Refer to Sheet No. 2.) Make certain that all soldered joints are leakproof and do not contain excess solder which increases the weight. Wash the tank thoroughly with fuel before installation. Soldering fluxes tend to corrode the interior of the engine. Also, do not spill fuel on the fuselage. It tends to soak it and increases the gross weight of the model.

ENGINE IGNITION. Engine ignition is accomplished by means of *Arden* glow plugs in order to reduce the weight and the over-all dimensions.

FLIGHT CONTROLS. The *duralumin* pulley is machined to the dimensions shown on Sheet No. 2. The control pulley is secured by a specially machined rivet, the length of the shank being variable for clinching purposes to suit each installation. The push-pull rod is made of hard steel wire, and is installed in two pieces, then soldered together, to facilitate installation. The rod is secured to the pulley by means of a rivet. Make certain that the rivet is tightly secured and is in proper position for safety. The flexible control cable passes around the control pulley groove to prevent slippage. The cable passes into the pulley under the rivet head and is continuous, out to the plywood line guides which are cemented to the underside of the left wing panel and are set into a groove to prevent slippage. The line guides are faired smoothly to the underside of the wing. Make certain that the rivet that secures the flexible cable to the control pulley is securely attached for safety purposes. No. 50 drill size holes will clear the control cables with ample clearance.

The control push-pull rod is attached to the dural elevator control horn, the details of which are shown on Sheet No. 1. Make certain that this horn fitting is secured firmly in position by means of the countersunk duralumin rivets. This type of control system, if properly constructed, has a minimum of lost motion.

The cutout in the vertical fin permits the use of a one-piece elevator. The control horn is mounted in line with the cutout in the fin. Allow a 1/32" clearance for the elevator range of movement from the edge of the cutout in the fin. Note that the vertical fin on the *McCoy* model is slightly reduced in area.

ENGINE MODIFICATION. In order to obtain a minimum of projected frontal area, the fins on each engine have been turned to a smaller diameter, those for the *Hornet* being 1.670" in diameter and those for the *McCoy 49* being 1.520". The engine lugs are filed to conform to the fuselage engine bearer lines. The engine exhaust stack is cut short to conform to the lines of the engine cowl.

PROPELLER INSTALLATION. A single blade propeller of special design is used. This propeller is carved by hand and is made from carefully selected and well-aged maple. The *Froom* type propeller spinner has been counterbalanced to permit the use of a single blade. The pitch for this type of propeller is 12 inches, high for this type of propeller design, but it has been found usable on both engine installations.

WEIGHT AND BALANCE. The models are balanced, with a full fuel tank, at the leading edge of the wing tip. The gross weight for the *Hornet* ship is 26.75 oz., whereas the *McCoy* model weighs 22.12 oz.

DOLLY DESIGN. Note that these models are of the lift-off type for use with a conventional dolly fitted with race car wheels to assist in obtaining proper tracking and launching at high speed.

PREVIOUS PERFORMANCE RECORDS. Both of these planes, which are of the same general design except for engine installation, were built for experimental high speed basic training purposes. Certain innovations in the design were made by the builders to allow test flight at high speeds and to engage in a series of experiments with fuel adjustment. The *Hornet* ship (AMA30793) and the *McCoy* job (AMA30789) formerly held the world's speed records for Class D and Class C competition, the record speed having been made at the Los Angeles record trials on February 29, 1948. The *Hornet* had one test hop prior to the record trial, whereas the *McCoy* set the record during the initial test hop; previous testing was not possible prior to the competition. This is interesting in that it proves the sound ideas of these designs. Since then, the builders have used these models for experimental high speed flying and have exceeded the previous records in routine test flights. Several types of fuel systems have been used with varying success. The *Hornet* job has exceeded 153.25 m.p.h. on occasion, whereas the *McCoy 49* powered plane flies at a speed in excess of 140 m.p.h. For a design that will give you real high speed experience, these models are relatively easy to construct. A fuel mixture of nitro-methane, one part Baker AA castor oil, and two parts methanol is used. When using this kind of fuel, exercise the usual safety precautions.

LAP CLOCKING. At the speeds at which these models have been flown, lap clocking by stopwatch is preferable. An assistant should be available who will check the speed until two secs. per lap is attained; then a check for official speed timing is called. In this manner, flying close to the ground at level altitude is undertaken after the fuel mixture and the engine operating temperature reach an optimum condition. Lap clocking requires that the assistant snuggle under the pylon during the speed trials.

To train for competition for high speeds above 140 mph requires considerable practice and fortitude on part of the pilot. You can't train for this kind of competition with a plane of only moderate speed. All of the techniques of handling the plane for the optimum conditions of speed and fuel mixture can only be attained by consistent practice. It is suggested that beginners to speed flying study the article, "How to Break a Speed Record" in the November 1948, issue of MODEL AIRPLANE NEWS.

In conclusion it should be pointed out that while we call the models described in this article "trainers," they are plenty fast enough to win trophies for you in most local and area meets.

PHOTO CREDITS

Page		
1	(All)	B. L. J. Neal
6	(All)	Acme
13	(All)	Jim McClelland
21	(All)	Leonard Wieczorek
27	(All)	Raymond Studios

(SEE OFFICIAL ENTRY BLANK ON OTHER SIDE—PAGE 44 OF THIS JUNE 1949 ISSUE MODEL AIRPLANE NEWS)

Official Information Bulletin 18th National A.M.A. Model Airplane Championship Meet

WHERE

Outdoor events at the U. S. Naval Air Station, Olathe, Kansas.

Indoor events at the Municipal Auditorium, Kansas City, Missouri.

WHEN

Competition: July 26th through 31st, 1949 (six days).

Registration: July 25th and 26th (Monday and Tuesday).

OFFICIALS

Contest Director, Jess Hall, Olathe, Kansas.
Contest Supervisor, Val Sherrard, 1021 W. 6th, Topeka, Kansas.

Directors: Rubber & Glider, Indoor and Outdoor:—Jim McClelland, Independence, Kansas.

Control line speed:—Richard Gelvin, St. Louis, Missouri.

Control line stunt:—Roy Mayes, California.
John Clemens, Dallas, Texas.

Free flight Gas:—Leo Rutledge, Wichita, Kansas.

Radio Control:—June Pierce, St. Joseph, Missouri.

Field Manager:—L. L. Cooke, Kansas City, Missouri.

Recording and Timing:—Mom and Pop Robbers, Oakland, California.

Timing will be by members of the United States Navy under the supervision of field judges certified by the Academy of Model Aeronautics.

HEADQUARTERS AND REGISTRATION

Legion Memorial Building until July 25th. From July 25th on, Headquarters will be at the Naval Air Station, Olathe, Kansas. All advance entries should be made to Jess Hall, Contest Director, Olathe, Kansas.

HOUSING

All male contestants may be housed aboard the Naval Air Station at 35 cents (linen charge) for the six day event. Meals for all contestants will be provided at the Navy Mess Hall at about $1.05 per day or portion thereof. Female contestants will be provided suitable accommodations in private homes in Olathe at very low cost. Persons desiring hotel accommodations in Olathe or Kansas City (26 miles away) should submit requests to the Contest Director at the earliest possible moment.

Contestants living aboard may use the Navy swimming pool, the largest in the Midwest. Bring your trunks.

A 24 hour guard is provided by the Navy at the dormitory aboard, but the Navy assumes no responsibility for loss or theft. Locker space is very limited.

Parking space is ample adjoining sleeping quarters and workshop.

All bus, rail, and airlines converge on Kansas City. Busses of the Missouri Pacific Trailways marked "Olathe Base" leave the terminal at 11th and McGee, Kansas City, hourly.

Ship all planes and personal gear via Railway Express direct to Olathe, Kansas.

MEETINGS

The Academy of Model Aeronautics will hold Executive and Leader meetings, in addition to Contestant meetings, during this period.

PRIZES

In addition to the coveted perpetual awards, new perpetual trophies will be announced later. The permanent trophies this year are exclusively designed for this meet, and have never been equalled in distinctiveness. Added events, such as the Pan-American Airways "PAA" Load event, will be explained later.

ADDED

On the afternoon of July 30, and again on July 31st, the Navy will present an air show for the entertainment of both contestants and spectators.

VICTORY BANQUET

An outstanding Victory Banquet will be held Sunday evening, July 31st, after which trophies, prizes, and awards will be given to winners in the 51 events. In addition to perpetual trophies, permanent trophies will be given to the first four places in each event, with suitable recognition made through the first 12 winning places—this, in addition to merchandise prizes provided by the model industry.

GENERAL INFORMATION

The U. S. Naval Air Station, Olathe, was established in this part of Kansas because it lies outside of the high wind belt. Maximum free-flight recovery is assured by down-wind ramps, radio communication, recovery jeeps, flight cover (provided by the Sheriff's Air Patrol of Jackson County) and by the fully organized co-operation of surrounding farmers, and state and local police patrol.

Eleven new world records were established at the Nationals at Olathe in 1948, and free-flight recovery was 93.3%.

A complete line of model airplane parts and accessories will be available at the Meet workshop. Food and drink for contestants and spectators will be provided at concessions on the Naval Air Station.

Church services will be held at the Station Chapel on Sunday, July 31st.

Every effort will be made to make your visit to the 1949 Nationals at Olathe a pleasant and satisfactory one. Additional information may be secured from:

JESS HALL, Contest Director
Legion Memorial Building
Olathe, Kansas.

1949 NATIONAL MODEL MEET OFFICIAL ENTRY BLANK

AMA Sanctioned AAAA Model Airplane Championships held at U. S. Naval Air Station, Olathe, Kansas (Indoor events Municipal Auditorium, Kansas City, Mo.) 26th through 31st July

Sponsored by Olathe Chamber of Commerce and American Legion Post No. 153
Address all correspondence to JESS HALL, Contest Director, Olathe, Kansas

PLEASE ENTER ME IN THE FOLLOWING EVENTS OF THE 1949 NATIONALS AT OLATHE (check events):

Indoor hand-launched glider ....
Indoor stick event ....
Indoor cabin ....
Mulvihill stick ....
Stout cabin ....
Tow line glider ....
CO2 free-flight ....
Free-flight gas Class A ....
Free-flight gas Class B ....
Free-flight gas Class C ....
Free-flight gas Class D ....
Free-flight gas seaplane ....
Radio control ....
Control line speed Class A ....
Control line speed Class B ....
Control line speed Class C ....
Control line speed Class D ....
Control line speed Jet Powered ....
Control line novelty ....
Control line scale ....
Control line precision ....
Outdoor hand-launched glider ....
Flying scale rubber powered ....
Pan-American "PAA" Load Event ....

TOTAL ENTRY FEES ....
Enclosed Check ( ) Draft ( ) Money ( ).

RESERVATIONS FOR HOUSING

Male contestants will be housed at the Naval Air Station, Olathe, for 35 cents linen charge for the entire six days. Both male and female contestants will be furnished three meals daily at about $1.05 per day, or portion thereof, at the Navy's general mess.

Reserve quarters at Station ....
Reserve Trailer space for ....
Reserve rooms in private home ....
Hotel reservations for ....

(State dates for nights wanted and accommodations and rates preferred.)

•

I hereby release the sponsors or directors of this contest, and the U.S. Navy, from responsibility for any claims of damage, loss, or injury resulting from any cause while attending this meet, and I also assume full responsibility for any damage or injury caused by myself or my airplane to any persons or property.

Signed ....
Address ....
City .... State ....
Club Affiliation ....
AMA No. .... Age ....

ENTRY FEES

Basic Entry Fee	$1.00
Each event or class entered	$ .50
Late Entry Fee	$1.00

All fees must accompany each entry. Deadline for entries without late entry fee is midnight, July 12, 1949. Entries postmarked after that time will be accepted only on payment of additional $1.00 Late Entry Fee.

•

PARENTS CONSENT, WAIVER, RELEASE:

As parent and/or natural or legal guardian of

....

a minor, I hereby give my full and unqualified consent to his (her) participating in the 1949 National Model Airplane Championships, and to his (her) accepting any and all awards whatsoever that he (she) may win, whether it involves travel or otherwise.

In consideration of their sponsorship of this Meet, I hereby release the Olathe Chamber of Commerce, the Earl Collier Post 153 of the American Legion, The Academy of Model Aeronautics, the U.S. Navy, and any organizations and all persons connected with said meet, from all claims which may arise with said meet.

Signed ....
Address ....
Witness ....
Address ....

*This parents' consent must be signed before entry of any contestant under 21 years of age can be accepted.

(SEE OTHER SIDE—PAGE 43 OF THIS JUNE 1949 ISSUE MODEL AIRPLANE NEWS—FOR FURTHER INFORMATION)

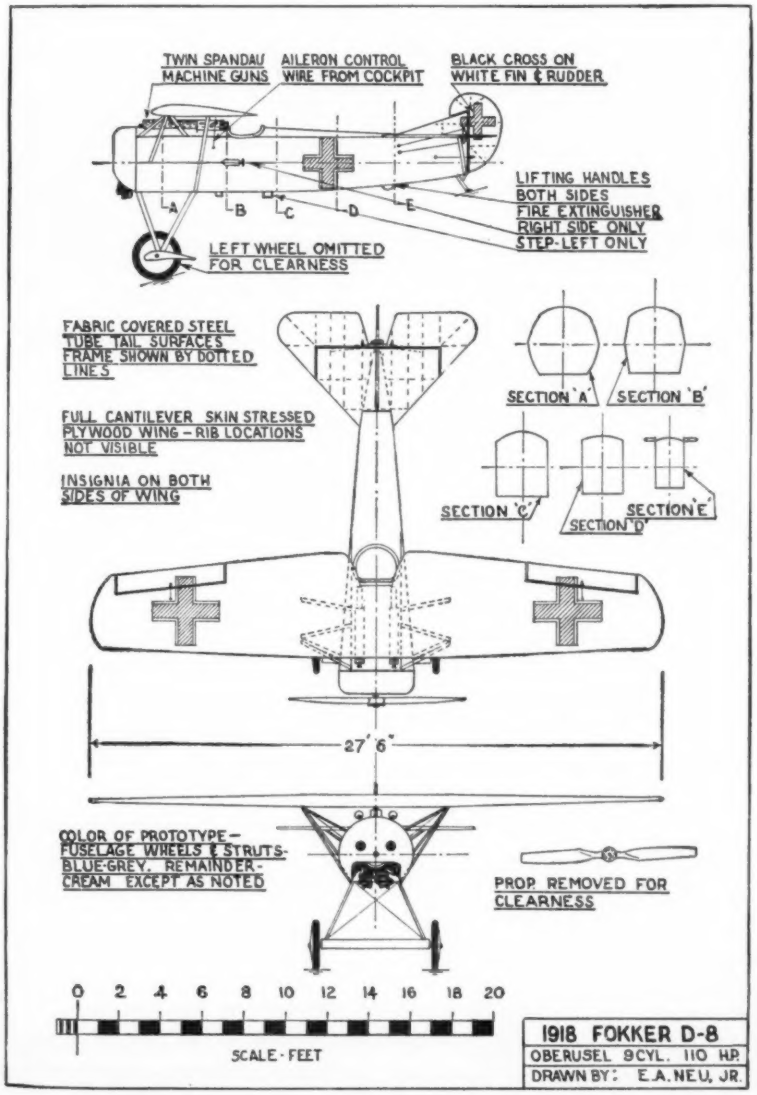
Olathe Revisited

(*Continued from page 13*)

INDOOR AT K.C. Only 20 mi. away is Kansas City, with its famous Twelfth Street (from where came much of America's jive music) and that big Municipal Auditorium, one of the largest enclosed areas in the world. The "Muny" proved ideal for the indoor event last year. You'll be glad to know it's all signed, sealed, and delivered as the place for this year's indoor meet on Tuesday, July 26—all the space a micro freeflier can use, a twenty-five minute ceiling so high you'd swear there are clouds in the upper reaches. The gang got a real kick last year when a city fire truck came right through the arena doors, raising high aerial ladders to fish out planes that had come to a landing in the lone chandelier.

NAVY SHOW TO BE AN EXTRAVAGANZA. On Saturday and Sunday after flying hours, the Naval Air Show will, indeed, be something to see. The latest and best in ships and pilots will give contestants and spectators a sight to remember. Featured will be the Navy's exhibition teams, the Blue Angels with F8F Grumman fighters. These ace stunters are making their first appearance in the Mid-West. The trip to Kansas will be well rewarded by a ringside seat for the stupendous show. The aerobatics will not cut into the contest but will come after thermals are over.

HOUSING AND FOOD FOR ALL. Capt. Campbell Keene, host at the U. S. Naval Air Station and Lt. Comdr. Tex Witherspoon, Public Relations Officer, are planning for many more guests this time. Aside from the ammunition dumps, there will be little space aboard marked "Restricted." This year there will be special quarters for the women on board, and they will have meal tickets the same as all male contestants at cost to the Navy. Last year food was $1.05 a day, with linen for the duration at 35c. The figures will be approximately the same this time. Putting first things first, remember that food last year! Only the bread basket of America could provide those big servings of roast beef and ham, that assortment of vegetables and the generous hunks of pie. The large swimming pool will be open and even more appealing than last year if Kansas has its usual July brand of shirt-sleeve weather. Bring those



swimming trunks and take a dip in the pool before dinner!

A REAL MODEL SHOP. Visitors, especially during the night hours, were really impressed with the activities in the large hangar shop with its circle of benches where many contestants worked the night through building and repairing ships, and breaking in motors. The shop was wide open twenty-fours hours a day. It was not only a center for work but a meeting place of East and West for forming new friendships and staging bull sessions. All the theories in the books were exposed with the usual conflict of opinion that characterizes a modelers' gab fest. Model supplies will again be on hand at all hours at current catalog prices.

OLATHE, THE CROSSROADS OF AMERICA. The site of the Nationals is almost the geographic center of the United States. Excellent highways make Olathe, which is about 20 mi. west of Kansas City, easily accessible by car. For those who drive, the following advice is offered: from the East and Northeast, cross Missouri on US 36 to Cameron, then south on US 69 to US 50. Highway 69 skirts Kansas City and avoids city traffic. From the West, the best routes through Kansas are US 40 and US 50S. The Air Station is on US 50S. From the South, a good route is US 69 to Stanley and West 8 mi. to Olathe. From the North, US 73 on the Kansas side, and US 69 and 169 on the Missouri side are recommended.

EXPERIENCED OFFICIALS. The top technical man directing the meet will be Jim McClelland who handled Indoor last year. He has years of experience behind him and is a member of the AMA Contest Board. For many years Jim was an aeronautical engineer at Wichita. Recently he returned to his old home town, Independence, Kansas, and is running a small manufacturing plant, producing hardware for the building trade. Jim is tops as an official at anybody's meet and he has been contest director at a score of them. With him, a rule is a rule and is the law until it is changed. So better polish up your take-off gears, for it will be ROG, when the rules say ROG. If you don't like the rule, well, change it, but so long as it is on the books it is a "must" at meets that Jim directs. Exact, fair, legal management, with two meaning not 1.9999 but 2, will be the practice with Jim McClelland as contest supervisor.

Some of the lieutenants under McClelland may be announced while others are still being selected, but contestants will be assured competent officials at each post. Field Manager will be L. L. Cooke of Kansas City who handled U-control last year. Recording and Timing will probably be handled by Mr. and Mrs. Bill Sparks of Kansas City. Bill is the new president of the Mid-States. In charge of Speed will be Dick Gelvin of St. Louis. Leo Rutledge of Wichita, AMA Vice-President, will handle Rubber and Glider, and Jean Seele of Topeka, who directed ROW with such satisfaction last year will have all Free Flight Gas. Of course, June Pierce of St. Joseph will again have direction of Radio Control, and he hopes to have the assistance of Mike Thomas, the new Secretary-Treasurer of the AMA.

TRAINED TIMERS AGAIN. Probably the chief factor which made the Olathe meet last year so widely praised by the contestants was the quality of the timers. Trained Naval personnel will again handle the stop watches and the timing slips. Many who worked at the pits last season will be on deck with their experience and cordiality. The timers last year

C. O. Wright firing up during Class B Gas day at '48 Nats

were given a post-contest entertainment by courtesy of the contestants who contributed to a "kitty" passed around by Red Hillegas and Frank Greene.

CARROLL SOUND ON THE JOB. Art Carroll, sound expert of Topeka, will again be on board with an even more elaborate collection of sound wagons and telephones. As an announcer, Art received a big hand from the boys last year. His services will be even more superlative in '49 since he knows more about model aviation and the personalities of the model world. Art coordinated the day-by-day show, and hollered "Heads Up!" as often as necessary to provide safety for the contestants and spectators. All will be delighted to renew friendships that were established last year with the Sound Man of Model Aviation.

BUSINESS SESSIONS OF THE ACADEMY. Of major interest at all Nationals are the Annual Meeting of the AMA, the open meetings of the Contest Board, and other business sessions. All Academy committees are scheduled to meet at 2:00 p.m., on Monday, July 25. There will be meetings of the contestants in the evenings of Monday and Tuesday. The Annual Meeting of the Academy, so important in AMA life, is scheduled for Thursday, July 28, at 7:30 p.m. The open meeting of the Contest Board, with Walt Good in charge, will be at 7:30 p.m., on Friday, July 29. There will be meetings of the Executive Council and various committees during the week, which will be announced later.

GET YOUR ENTRY IN EARLY. The management is anxious that entries be sent in as soon as possible. An entry blank was printed on page 47 of the May MODEL AIRPLANE NEWS (also page 43 of this issue), and additional blanks may

Jim McClelland, newly appointed Contest Supervisor for Nationals this year

be secured by dropping a card to Jess Hall, Olathe, Kansas. Early applications will help the sponsors and assure that adequate provisions will be made to house and feed all who come. Help the Olathe fellows by sending your entry in now. Watch this magazine for schedule changes, new events, or announcements as they are released.

SCHEDULE OF EVENTS

(Tentative and subject to possible change)

1949—18th National AMA Model Airplane Meet
Olathe, Kansas, July 26 to 31

Registration at Naval Air Station, July 26-27, 8:00 a.m.-10:00 p.m.

Tuesday, July 26
- Indoor—K.C. Municipal Auditorium (Testing flying, all classes, possible at Naval Air Station)

Wednesday, July 27
- Outdoor Stick
- Free Flight Gas A
- Control Speed D
- Controline Novelty
- Radio Control

Thursday, July 28
- Outdoor Cabin
- Free Flight Gas B
- Control Speed C
- Controline Precision (Eliminations)
- Radio Control

Friday, July 29
- Rubber Flying Scale
- CO_2 Event
- Free Flight Gas C
- Controline Speed B
- Controline Scale (Eliminations)
- Radio Control

Saturday, July 30
- Towline
- Free Flight Gas D
- Controline Speed A
- Controline Precision (Finals)
- Radio Control
- Blue Angels—Naval Air Show

Sunday, July 31
- Hand Launched Outdoor Glider
- ROW Free Flight Gas
- PAA-Load Free Flight Gas
- Controline Jet
- Controline Scale (Finals)
- Blue Angels—Naval Air Show Racing

(There is talk of a team event in control and a helicopter event in rubber. If interested, write Jim McClelland, P. O. Box 468, Independence, Kansas.)

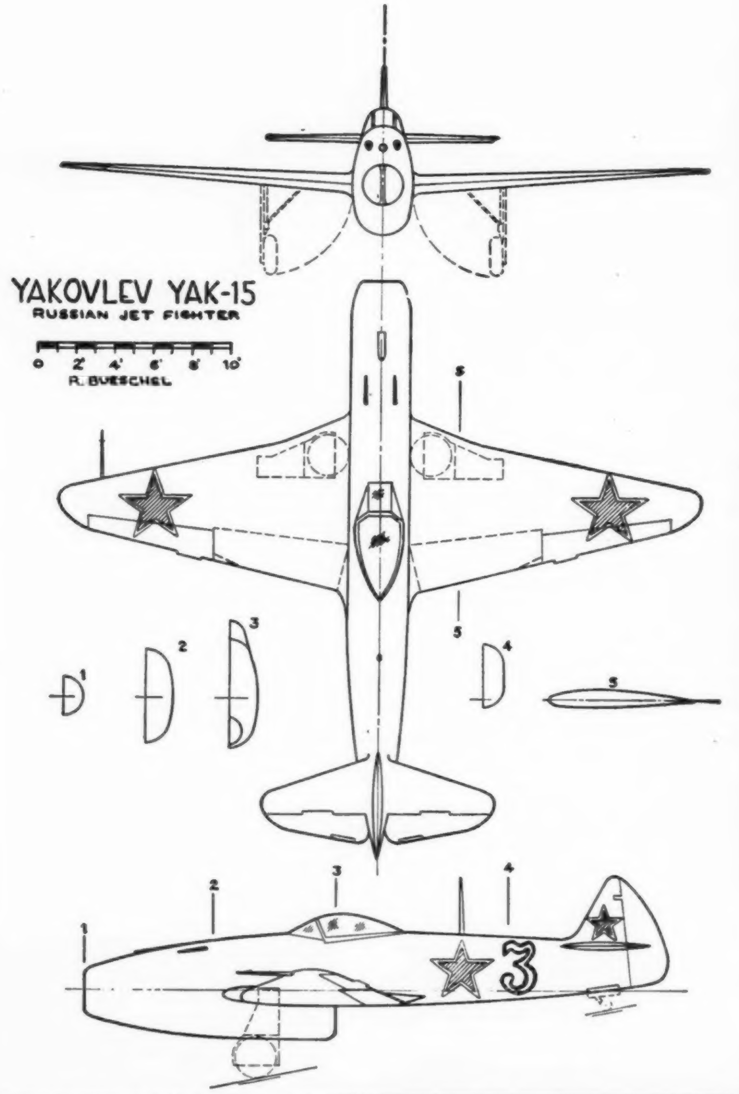
Stinson Trimotor

(*Continued from page 23*)

Two coats of dope on the entire model will suffice, and will assure you of a very good looking model. The prototype was a dark Stinson blue, if it is desired to color dope the model.

FLYING: Four strands of 1/8" flat brown rubber was used to power the original model with excellent results. Glide the model with a few hand turns on the rubber to obtain a flat mushing glide (with the scale props removed, if model is to be flown without these in place). Model may be made to turn in either left or right circles by removing only one of the outboard props. It will turn toward the remaining prop because of the drag of the prop windmilling.

After getting the desired glide results, put the winder on and watch the admiring glances of the other modelers when the ship is airborne after a very realistic take-off run.



Midget Mustang

(*Continued from page 21*)

and single-disc brakes are fitted, as is a spring-leaf tailskid with replaceable shoe-type skid. Brakes are hydraulic and operate from the rudder pedals and a master cylinder mounted on the front bulkhead of the fuselage.

Trailing edge flaps are mounted along the inboard trailing edge of the wing. They are mechanically operated from the lower left side of the cockpit and the lever may be locked in three positions.

The wing uses conventional two-spar construction and is attached to the fuselage through two shear bolts at the front spar and a single hinge bolt at the rear spar. The spars attach to heavy bulkheads which comprise a carry-through structure; the front bulkhead carrying the instrument panel and the rear bulkhead the overturn structure with the pilot's seat located between them. The wing is flush-riveted throughout and wing walkway areas are reinforced. The wingtips are removable.

All control surfaces are metal covered, with the elevators and rudder cable-controlled and the ailerons operated by push-pull rod controls. A double-acting

spring bungee system, controllable from the cockpit, is used to operate the horizontal stabilizer incidence setting for longitudinal trim. Metal tabs, adjustable on the ground, are used for trimming on rudder and ailerons.

Power is provided by a Continental C85-8FJ 4-cylinder horizontally-opposed air cooled engine, which develops 85 hp and uses fuel injection. The engine is neatly cowled with air intakes mounted in the nose and the fairing terminating at the wing leading edge in a jet exit to maintain cooling air flow. The engine turns a fixed pitch Sensenich wooden propeller with the exact model determined by the purchaser, who may select a pitch best for rate-of-climb or for high speed level flight. The engine is mounted on steel tubular mounts from the firewall at the main bulkhead and is attached by four bolts through rubber shock mounts.

The canopy is a one-piece molded plastic design, which is secured by a latch on either side of the plane, thereby making it possible to enter either side by releasing the latch on that side or to jettison the canopy in flight by simply unlatching both sides at the same time. A quick-release safety belt and shoulder harness is provided, in accordance with racing requirements.

Wing span of the *Midget Mustang* is 18' 6" and it is 16' long and 4' 6" high. Although exact weight of the production model cannot yet be determined, the prototype weighs just slightly over 500 lb., the minimum required by the Professional Race Pilots Association. The reason for requiring this minimum weight was to prevent inexperienced builders from cutting the weight of their entries to the danger point in the hope of attaining higher speed, a logical thought since all of the racers are powered by the same engine! Another important reason was that with the wing area established at a minimum of 67 sq. ft. and the weight at a minimum of 500 lb., a wing loading of 7.5 lb. per sq. ft. is established; that is a very moderate figure and guarantees against tricky handling characteristics and, particularly, high landing speed.

The *Midget Mustang* has a top speed of 200 mph, which will astonish present owners of planes with only 85 hp! It cruises normally at about 170 mph and lands at only 53 mph with flaps extended, a surprisingly moderate figure for a "racing" airplane. It has a rate-of-climb of 1300 ft. per min. At cruising rpm, the *Midget Mustang* burns only 6.8 gallons per hour, or about 25 mi. to the gallon, which is better than your own automobile! Fuel tank holds 15 gallons, so that the plane has a range of about 375 mi. The production version will feature a baggage compartment behind the pilot's seat that will accommodate a 35-lb. suitcase or hand bag.

But the big question is how much will all this cost? Here is a plane with racing performance yet with fuel economy and safety of operation that is only starting in production. All this should mean a healthy price tag that runs up in the $25-30,000 bracket. Well, brace yourself for a surprise! Both Long and the Schweizer brothers intend to sell this mighty little airplane package for less than $5,000, which places it smack down in the competitive range with many current personal aircraft which, although carrying passengers, can't match the *Midget Mustang* in performance!

But both Long and the Schweizers have been in this business long enough to know a few things, one of which is the formula for failure in launching a new airplane into production. So they are avoiding all of the pitfalls that eager amateurs invariably stumble into: selling of interests and the raising of excessive capital, which usually goes for a huge inventory of raw stock and purchased parts intended for the "mass production" of their dream child, but not so this professional group. First of all, Schweizer is going to build the airplane in small groups of five or ten, ordering material only for this quantity and completing and selling the lot before new purchases are ordered. And, what's more, that original group of ten is not going to start down the line until ten firm, deposit-paid, orders are on the books. And, as an extra safeguard, Dave Long is remaining right where he is on the drawing board at Piper Aircraft!

But the tremendous interest in this high-performance, single-seat "racing type" personal airplane has been shown throughout the years; culminating in the clusters of eager fans peering into the cockpit of the *Midget Mustang* at its air race appearances, it is certain to express itself in tangible orders for the new plane. And with that low price tag on the article, the appeal is certain to prove too strong to resist for dozens of pilots.

Scale Model Details

There seems to be a tremendous interest in scale modeling and the exact duplication of all features of a large plane in miniature. We will present in our July issue, ideas on the duplication of control systems, so you can have realistic moving control surfaces on your next scale model.

Air Ways

(Continued from page 33)

Harold Bunting, but as yet has not reached the speed that Glen feels it capable of. It is powered by a standard model *Dyna Jet* and when photographed had reached a top speed of 118 mph.

Picture No. 10 illustrates something a little unusual in the way of a stunt ship. This is an original design called *Voodoo* by designer Eddie Campana (29 London St., Sault Ste. Marie, Ontario, Canada). Powered with a *Super Cyclone* it appeared to be a promising stunter. The wing span was 40" and although total weight was a bit high at 3-1/2 lb., the performance didn't seem to suffer any. This ship was found to be very sensitive on control and capable of really square turns. Such violent maneuvers, however, led to gas tank trouble which we trust Eddie has been able to lick by now.

The scale B-17 in our last picture is finished so neatly that it is hard to realize the wing span is only 15". The model was built by Gil Minnigh (Box 2121 Station A, Cumberland, Md.) while he was stationed at Williams Field near Phoenix, Ariz. Since he was flying these ships at the time, he was able to incorporate many details measured direct from the big job. The model is complete with retractable gear, plastic nose, cowls and gunner's turret; the engines and propellers are built up. Gil writes that he has been a faithful reader of MODEL AIRPLANE NEWS for 15 years and has found the material in our pages extremely helpful in his modeling work.

NEWS OF MODELERS

PEN-PAL SEEKERS: Floyd Carter, 9632 San Vincente, South Gate, California . . . V. E. Smeed, Studios, Charles St., Herne Bay, Kent, England . . . Alfred Richter, 24a Hamburg-Harburg, Grumbrechtstr 70, Germany . . . Rune Johansson, Smalandsgatan 32, Norrkoping 8, Sweden.

EXCHANGE MOTORS: D. Reid, c/o Ross, 360 Auchmill Rd., Bucksburn, Aberdeenshire, Scotland . . . M. A. Gomm, 156 Streetsbrook Rd., Shirley, Nr. Birmingham, England . . . J. R. Goatham, 15 Hollybush Rd., Gravesend, Kent, England . . . B. Tallerton, School House, One Warwick Ave., Bedford, Beds, England.

EXCHANGE MAGAZINES, PLANS, ETC.: H. Chester (40), 63 Queen's Dr., Finsbury Park, London, N. 4, England . . . Winfrey James Walker, Normanton, 50 Beechfield Ave., Birstall, Leicester, England . . . Gordon Macdonald, 9807 160th Ave., Howard Beach 14, Long Island, New York . . . R. S. Raddem, Gordonville, 73 Athenaeum Rd., Whetstone, N. 20, England.

SPECIAL REQUESTS: P. J. Curtis, chairman of the *Westbourne Model Aviation Club* (310 Poole Rd., Westbourne, Bournemouth, Hampshire, England) would like to contact an American controline club of about 40 members . . . D. B. Ashman (72 Whitehouse St., Middlesbrough, Yorks, England) also is seeking a club to write his organization—the *Darlington Model Club* . . . Cyril A. Shaw (Ten Windsor St., Chertsey, Surrey, England) would like to correspond with someone interested mainly in speed models . . . Antonio Mizzan, 19 years old, would be willing to correspond in English, French, German, or Italian with some American boy or adult interested in all-wing or tailless (gas or glider) and in scale models. Address: Via Giordano Bruno 10, Gallarate, Varese, Italy . . . T/Sgt. Howard Chester, Jr., AF6978640 (Hq. 1954th, AACS Sqdn., APO 994, c/o Postmaster, San Francisco, California) feels the article on the Trans-Atlantic Gassie, by Mr. Gordon Light in our February '49 issue, is very important and would enjoy corresponding with anyone interested in this type of flying.

CLUB NEWS

California

The *Pterodactyls* are working on model planes for the Youth Talent Exhibit. Darrel Larks is building a series of historical replicas of airplanes. His exhibit will include the Wright brothers' ship which was first flown successfully on December 17, 1903, Jimmy Doolittle's *Gee Bee* Racer, and Amelia Earhart's Lockheed. Larry Giordanengo is also building a series of models, illustrating the history of aviation. His models will show various types of experimental ships. Larry is also going to exhibit the Floater with which he won his national record.

Sacramento Skyoneers are making extensive preparation for their Annual Free Flight Contest which will be held June 5, at Mather Field. Jack Babcock will be Contest Director. Anyone wishing to contact him may do so by writing to 2961 Rubicon Way, Sacramento.

Florida

The *Jacksonville Model Airplane Club* has scheduled a free flight meet—the Dixie States Model Airplane Contest—to be held at Herlong Field, Jacksonville, on Sunday, July 3. Time: 10 a.m. to 6 p.m. Events will be A, B, C, and D Gas, Radio Control, Rubber, Towline, and Hand Glider and also a special Wakefield event. The meet is open to all AMA license holders.

Illinois

After the huge success of the contest held last year by the *Strato-Cats* and *Chi-Hi Gremlins*, the *Strato-Cats* are planning to hold an identical contest August 7. Sec. Donald Ore would appreciate it if any other clubs sponsoring a contest in the Chicago vicinity on the same date would contact him at 14906 Center Ave., Harvey, Ill. The club promises to be much more active this year even though they have lost five members—three to school and two to the service. The lack of a flying field has been their biggest handicap thus far.

The *Sod Scoopers* elected their 1949 officers recently. Pres., Tony Balchuk; Vice Pres., John Rains; Treas., Jack Kallin; Sec., Charles Reck; and Contest Director, Paul Maxwell. This club is devoted to controline flying and there is a growing interest in team racing and radio control. Models are flown at the Danville Municipal Airport.

The 1949 Midwestern States Contest to be held June 29 will be sponsored and run jointly by the *Chicago Aeronuts* and the *Gas Model Aeronuts*. Present intentions are to hold the meet at 82d and Pulaski, Chicago's Southwest Side. Prizes this year are expected to exceed the 42 trophies and merchandise awarded last year. As was the case last year, sunburn is offered gratis to all entrants along with a free bottle of pop to all contestants turning in a ten-minute flight. Persons interested in securing membership in the *Chicago Aeronuts* club are invited to write to Sec. William Erlich, 2513 North Sawyer Ave., Chicago.

Iowa

The *Decorah Skymasters* will hold

their 3d Annual Controline Contest on the Luther College Athletic Fields in Decorah on July 17. The meet is sponsored by the local V.F.W. Post. There are $500 in trophies, engines and kits. Registration must be in by 1 p.m. on the day of the contest.

Maine

The *Hedgehoppers* (Bangor) adopted a new club charter at their meeting of March 1. This charter is designed to streamline the meetings and improve club organization. Sheldon ("Shelby") Lewis was elected president. They plan to hold their 2d Annual Flying Fair on July 10.

Portland has another model airplane club! They call themselves the *Flying-Nine*. Charlie Mann and Bill Levi are president and secretary-treasurer, respectively.

The *Augusta Flying Maniacs* will hold their 2d Annual Model Derby on June 19 at the Capitol Park Athletic Field, featuring the following events—Open Speed A, B, C, & D; Jr. and Sr. (combined) Speed A, B, C, & D; Open Stunt; Jr. and Sr. (combined) Stunt; and Open Scale (all classes combined). A one dollar entry fee is being charged regardless of the number of ships entered. The entry fee is to be paid no later than June 7; all entries received after that date will be returned. This must be done in order to determine beforehand just how many classes will have the minimum number of entrants. There must be at least five entrants in each class.

Massachusetts

The *Tech Model Aircrafters*, an active organization based at the Massachusetts Institute of Technology, was formed about a year ago and the club now has about thirty members. Interest runs all the way from microfilm to jets and they have even invented several new classifications to keep interest at a high pitch. One of these classifications is what they call the "Two-Bit" model. The model must fit unassembled into a standard shoe box, and the parts must be reassembled by hooks and gimmicks—no glue allowed. In addition, the model must carry a twenty-five cent piece completely enclosed in the fuselage. Top time for this type of model was turned in by a 200 sq. in. job which made 2 min. 14 sec. No one knows how the owner got a model of this size in a shoe box, but we are assured that it was done legally. The members are very much enthused over the newest thing in U-control, mainly Team Racing, and they have adopted the F. A. S. T. rules with very minor modifications. Since there are many rubber fans in the club, Wakefield enthusiasm is very high, and they hope to be able to place a member on the Wakefield team. Thanks to Myron Hoffman, 222 Babcock St., Brookline 46.

Michigan

Information on the 3d International Model Plane Contest, to be sponsored by the Plymouth Motors Corporation at Detroit August 22-29, has been released. This contest will be held in conjunction with the *Aero Club* of Michigan and sanctioned by AMA and will feature 50 indoor and outdoor events. Participation is open to boys and girls in four different age groups: Novice, 13 and under; Jr., 14-15; Sr., 16-20; and Open, 21-25. Entry forms may be had from all Plymouth dealers. The Novice group was added this year to assure the very young fliers of a reasonable chance in competition. The upper age limit in the Open Class

20th Anniversary!

With the July issue, MODEL AIRPLANE NEWS celebrates 20 years of publication as a model aviation magazine under the same name. We are sure readers, especially newcomers to modeling, are interested in famous models of past years. The July issue will include 3 views of many championship models of the past, with notes on their builders. This issue will in fact constitute a history of model aviation as we know it today. Don't miss it!

was decided upon since the Plymouth contests are designed primarily to aid the younger group of modelers. Many more special trophies will be awarded this year and winners of the first 3 places in each of the 50 events will receive trophies as well as U. S. Saving Bonds. Events in the Contest are: Towline Glider; Rubber Powered Outdoor Cabin and Stick; Free Flight Gas (Class A-D); Rubber Powered Indoor Stick and Cabin; Gas and Jet Controline; Controline Stunt; and Gas Controline Flying Scale. Controline events will be held at Belle Isle; Indoor events will be at the State Fair coliseum; Outdoor events will be held at a site to be announced later. The usual qualifying meets will be held throughout the country, so watch these columns for news of such meets and keep in touch with your Plymouth dealer to find out where the Elimination Meet for your particular area will be held.

New Jersey

The *Prop Washers Model Airplane Club* held its first meeting and election of officers February 17. Club interest is centered on U-control models although some of the members are active in free flight, gas, rubber and CO2 as well. Meetings are being held at the home of the president, Harry Williamson, at Leonardo, N. J.—no street address was given.

Since there are four other "Prop-Busters" clubs in New Jersey, members of the *Jersey Prop-Busters* recently voted to change their name of the club to avoid further duplication and confusion—the new name—*Garden State Aeronauts.*

New York

On March 4 *The Flying Bisons* elected their new officers for 1949 and the following evening a banquet was held. The guests were honored by speakers from Cornell Aeronautical Laboratory and various speakers from the model field. Pres., Stanley Wisinski; Vice Pres., Bill Radiggan; Sec., Leonard Wieczorek; Treas., Warren Gueer; and Corres. Sec., Francis Ptaszkiewicz. At the present time members are getting in shape by flying Sunday evenings in the State Armory, where record trials are going to be held in the near future. The new address for the club is 35 Peter St., Buffalo.

Another model club has been formed in this state—*Rochester Model Aircraft Association.* Enrolled to date are 43 members. Meetings are held the 1st and 3d Fridays of each month. John Schum is president. For information write to 176 Rock Beach Rd., Rochester.

Ohio

The *Greater Cincinnati Control-liners Model Airplane Club* (2131 Washington Ave., Norwood 12) is planning a controline contest in May. They would like to know approximately how many members of each club in the Cincinnati area will attend. There will be classes A, B, C, and D, Speed and Stunt. Full information on reply; when inquiring, give address of your local hobby dealer.

Below is a list of all the first place winners in each of the six events for the five grade groups in the National Model Plane Exhibit Contest held in the Higbee Company Auditorium, Cleveland, on March 12. EVENTS: *Built-up Military Open*—Don Wensel; *Grades 11-12*—Jerry Menter; *Grades 9-10*—John Humphrey; *Grades 7-8*—Norman Petrik; *Grades 5-6*

—Kenneth Gehrke. *Built-up Nonmilitary Open*—Charles Mencks; *Grades 11-12*—Harold Warner; *Grades 9-10*—Richard Raith; *Grades 7-8*—Peter Treiskolawski; *Grades 5-6*—Robert Hopkins. *Solid Military Open*—Jack Vopal; *Grades 11-12*—Charles Farley; *Grades 9-10*—John Humphrey; *Grades 7-8*—Ronald Schaefer; *Grades 5-6*—Don Maxas. *Solid Nonmilitary Open*—William Alexander; *Grades 11-12*—Joan Hrubec; *Grades 9-10*—Paul Stuerzenberger; *Grades 7-8*—Ed Gomersall; *Grades 5-6*—Lawrence Petrik. *Powered Scale Open*—Fred W. Dunn, Jr., *Grades 11-12*—Richard Timko; *Grades 9-10*—Paul Petersen; *Grades 7-8*—Frank Tabata; *Grades 5-6*—John Leicher. *Futuristic Open*—William Bett; *Grades 11-12* Spud Kohler; *Grades 9-10* — John Humphrey; *Grades 7-8*—James Shea; *Grades 5-6* — George Nemes. SPECIAL AWARDS: *Best Girl Model All Events*—Sue Swetman; *Best Futuristic under 21*—Jerry Gregorek; *Best Model Grades 5-6* All Events—Ken Gehrke; *Best Model by Boy All Events* — Jack Vopal; *Special Judges Award* — to all entrants from Rainbow Hospital.

The *Rubber City Aeronauts* of Akron have chosen a club emblem. It is a three-bladed prop superimposed over a circle with "Rubber City Aeronauts" lettered around the circle. The design was drawn by Bill Gerber. Also here are the results of the Akron Meet (40' Ceiling) held recently. *H-L Glider Open*—Dick Fox :34:6; *Sr.*—Paul White :27:7; *Jr.*—Spud Kohler :25:3; *Beginners*—George Pittinger :21:9. *Paper Covered Stick, Beginners*—Thelma Conrad 2:54:0. *Stick-Paper & Microfilm Jr.*—John Ward :15:0. *Stick-Microfilm Open*—Ralph Knapp 8:25:8; *Sr.*—Robert Madsen 5:20:0. *Cabin Open*—Ed Conrad 5:09:0; *Jr. & Sr., (combined)*—Roy Spicer 4:05:4.

Here are the Cleveland Meet (60' Ceiling) results. *H-L Glider Open*—Dick Obarski :39:9; *Sr.*—Gene Kemmerline :32:3; *Jr.*—Spud Kohler :31:0; *Beginners*—George Pittinger :28:0. *Paper Covered* Stick Jr.—Gerald Kedziora 3:06:7; *Beginners*—Thelma Conrad 2:46:0. *Stick-Microfilm Open*—Dick Fox 8:54:2; *Jr. & Sr. (combined)*—Al Chute 6:37:2. *Cabin Open*—Dick Obarski 7:57:2; *Jr. & Sr. (combined)*—John Humphries 5:28:0.

Oregon

The *Multnomah Doodlebugs* (3915 S. W. Dakota St., Portland 19) will hold their 2d Annual Free Flight Meet on July 31.

Here are the results of the first International Free Fight No Rules Contest presented by the *Fireballs* and sponsored by Jim Walker. It is believed that this is the *first* precision free flight contest held! The contestant lays out his flight plan, gives it to the judges, and tries to follow it. The plane has to land within 500' of a given spot or his score is forfeited. The contest was held at Hillsboro Model Airport, February 27. Owen D. Brown won first place with a total of 302 pts.; Richard Nichol was in second place with 300 pts., and Terry Crane took third place with 284 pts. (See *Scrap Box* in this issue for additional comments on this contest.)

The *Medford Prop Nuts'* Sec. Ed Sims sent us the results of their Free Flight Meet held March 13. *Class A Open*—Weyburn Keyon 354.7; *Class B Open*—Bill Franks 217.7 (2 flights); *Jr.*—Larry Edwards 440.3; *Class C Open*—Weyburn Kenyon 222.6; *Class D Open*—Weyburn Kenyon 364.9. The *Medford Prop Nuts*

have schemed up another new event to make contests more fun and interesting—it is known as a "scale Marathon." Ed Sims, at 23 North Fir St., Medford, will send you more information.

Pennsylvania

We have received word from James Schenck that the *Pittsburgh Conference on Model Aeronautics* is now an inactive organization. Mr. Schenck is at present acting as publicity director solely for the *Model Wings Club* of Pittsburgh. He tells us that work on the Hillman's Model Wings Airport is expected to commence early in April and should be completed some time in May. He repeats his invitation to any club in the Tri-State area to use the facilities of the model airport free of charge. Any clubs desiring such use should have their contest date cleared through the *Model Wings Club* at least three weeks previous to their meet. Address all correspondence to *Model Wings Club*, P. O. Box 7955, Pittsburgh 16.

Readers within range of station WHWL at Nanticoke should tune in on the hobby program carried by this station each Saturday morning from 11:05 to 11:30, conducted by William Jones. The program will include such items as news of contests to be held in the area, new kits and other products on the market, answers to listeners' questions, and so on. It is hoped to cover the subjects of model planes, race cars and railroads. For information on the program write to Mr. Jones, c/o WHWL, 38 E. Main St., Nanticoke.

Vermont

We read in the *Green Mt. Modeleer News* that the *Rutland Prop Busters* will have their Spring Meet on May 8—all day. By the way, Guest Editor of *GMMN* this month was Tad Dietrich.

Wisconsin

The *Thermal Duster Club* are sponsoring their 3d Annual U-control Contest on June 19, which will be held at Summit Park in Beloit. The contest is AMA sanctioned as an AA meet. Speed, Stunt, Scale and Jet events will be included in the day's activities. There will be two age divisions—Jr. (up to 18 years of age) and Open (over 18). The prize list will reach five to seven hundred dollars. Why not write to Merle Koebernick, 1337 Dewey Ave., Beloit, for more details.

Canada

The 11th Annual International Model Aircraft Contest will be held on July 10 (rain date July 17) at a field to be announced later. This contest will be sanctioned by the newly formed Model Aeronautics Association of Canada and only members of this organization and of the AMA will be allowed to enter. Events are Classes A, B, C, and D, Free Flight, Gas, Cabin Rubber. One other event is to be announced. For additional information contact Mr. J. W. Graves, 1555 Church St., Windsor, Ontario.

Design Forum

(Continued from page 31)

to its great power and light weight, but made efficient use of every fraction of this power because of its steadiness: it climbed continuously without erratic maneuvers that wasted power. So here is the type of design that will serve you well if you are thinking of entering free flight contests this season.

This design, in fact, may be improved

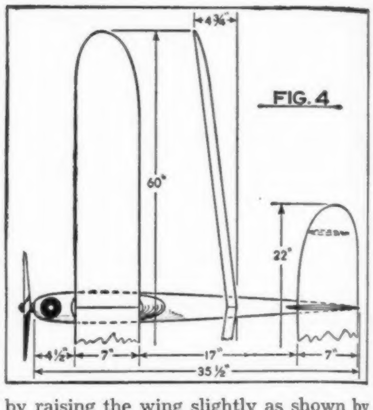


FIG. 4

by raising the wing slightly as shown by the dotted wing projection. The wing may be mounted on struts or on a *low* pylon. *This change raises the line of resistance* to increase the nosing up couple between the *center of resistance and line of thrust*. This is indicated in the Fig. 1 by the distance N. With a lower wing N is smaller. This larger nosing-up couple increases the angle and rate of climb because the couple itself noses-up the plane into a climbing angle instead of the plane being nosed-up by a down pressure on the stabilizer—a condition which is required when the *line of resistance is low*. Obviously with a down pressure on the stabilizer there is less total lift on the airplane and therefore less climb. The trick is to obtain lift on the stabilizer as well as the wing and yet have the model so set up that in spite of the lifting stabilizer it noses upward into a steep climb under power. We make use of the high line of resistance to achieve this result.

Examining the past still further, we cannot overlook the astounding performance of Russell Simmons' design shown in Fig. 2. Russell cleaned up in every contest he entered, with his brother a close second. Russell first astounded on-lookers at the Eastern State's Contest in 1940. His plane climbed like a rocket, in a steady straight line. It did not hesitate or deviate from this course until the motor cut. By that time it had reached tremendous altitude without losing an inch of altitude due to wasteful maneuvers. It was a typical example of the advantage of a properly located C.L.A., a reasonably high line of resistance, and large propeller area. At first glance you might think that the C.L.A. was comparatively high in this design. However, if you observe it more closely, you will note that wide "pants" streamlined the wheels. These were of considerable area and are below the C.G. As a result, they lowered the C.L.A. considerably—to a point approximately on a line with the center of gravity and thrust line. The wing, set up on the stubby pylon, raised the line of resistance for climb.

A feature overlooked by many was the propeller with large blade area. This was a vital factor in the performance of this airplane because, contrary to common understanding, a gas model propeller with unusually large blade area gives much better performance than the common run of the mill types used by most gas model fans today. These small area propellers give a wonderful effect on the ground. They rev-up with a dramatic roar, but in the air, very often that is all they do. They create great disturbance but *less thrust in flight*. The less dramatic large area propellers will not turn up fast on the ground but when they get into the

air, they pick up to their maximum number of revolutions and give far more thrust during *flight* than the toothpick variety propeller. In this case, propeller performance *on the ground* is deceitful.

Another fine contest type is shown in Figs. 3 and 4. In some respects it is similar to Leon Shulman's "Wedgy" but unlike Shulman's ship it has a low pylon movably mounted on the upper part of the fuselage. The pylon and this upper part are detachable and when in place serve to cover the motor and ignition units if this type of power plant is used. There is considerable advantage in this fuselage construction because it is light, sturdy and convenient. The lower part including the rearward section holding the tail is of "V" cross section with rounded top, all covered with 1/32" balsa sheet. The upper forward cowling may be either built up or carved out from a solid balsa block so that the walls are extremely thin. This construction allows irregular streamline shapes that are often difficult to reproduce in built up structures.

This design has the advantage of only one streamlined wheel in front which gives very little drag. The two fins extending downward from the stabilizer support the model in upright position when on the ground. The wing should have approximately 3° of incidence, this angle being measured between the thrust line and the chord of the wing which extends through the leading edge and trailing edge. The stabilizer may be positively cambered to provide lift and should be set at 0° to the thrust line.

Raising the wing on the low pylon makes it possible to use a minimum of dihedral and still obtain perfect lateral stability. The excessive polyhedral and high pylons used on many models is very much like using a shot gun to shoot a sparrow, rather than using "gray matter" to obtain stability with the least amount of dihedral and thereby maximum wing efficiency. Also, many model builders reason—"Why worry about reducing the dihedral, just use so much that you will be absolutely positive the plane will right itself." In so doing they often produce spiral instability and also lose considerable wing efficiency. A dihedral of from 3/4" to 7/8" on each wing tip for every 12" of span is sufficient, provided the rest of the airplane is perfectly designed.

The airplane in Figs. 3 and 4 will not require more than this amount because lateral recovery will take place during a turn or a bank before the nose can drop appreciably. It is this relation between lateral recovery *or roll about the longitudinal axis compared to turning about the vertical axis* that insures both lateral and spiral stability. Of course, the C.L.A. must be properly located in any event. Rotation about the vertical axis is reduced by a comparatively small fin and considerable area beneath the wing. This brings the C.L.A: well *forward* close to the C.G.

Another rarely observed advantage of this type of plane is the position of the C.G. below the thrust line. This resists stalling during a steep climb and tends to keep the model climbing steady. Its position, well below the wing, also provides the advantage of pendulum effect. We suggest that you try out this type of model at your next contest.

Suppose you design your model around a .199 engine; the plane then must weigh 20 oz., or more, to conform with the rules. There is no restriction on wing area, therefore your wing should be as large as possible. Its proportions for instance might be: span 60"; chord 7"; the moment

A Pusher Contest Model

A sure way to save propellers is to put them at the rear of your models, out of harm's way. Charlie Grant has worked out a prototype rubber contest model, that features a pusher prop, simple balsa construction, and outstanding performance. Look for Goosey Gander in the July issue.

arm M is approximately four times the chord or more. Then the center of the stabilizer will be approximately 28" rearward from the center of the wing. If the stabilizer has an area of 1/3 the wing area, longitudinal stability will be exceptional. The stab may have a span of 25" and a chord of 5-1/2". The total fin area should be approximately 25 to 30 sq. in. Some may wish to build heavier gas jobs; in this event increase the measurements of the airplane outlined here, in proportion to the size of your engine.

We will now answer a few pertinent questions asked by Henry M. Rowe of 150-06, 88th St., Ozone Park, N.Y. He is concerned about the placement of the bell crank on a U-control model. He says, "I have always understood the bolt had to be on the center line of thrust but now I have seen plans where they appear in any position on the fuselage. Are there any set rules in modern aerodynamics which covers its position?" Yes, there are. The position of the bell crank, *provided the wires are attached directly to it without being fastened to any other part of the airplane*, influences the attitude of the plane in flight. The point of attachment or contact of the wires either on the bell crank or on any other point of the model should be slightly behind the C.G. and approximately on a horizontal line passing through it. If the pull of the lines on the bell crank or on another point of the model comes forward of the C.G. it will create a nosing-in couple. The wire tends to pull in and the center of gravity rearward of it tends to pull outward; this swings the nose inward and results in the model diving in toward the operator, instead of pulling outward and remaining in its normal flight circle.

Usually the lines pass through guide loops attached to the wing. These loops should pass at equal distances on opposite sides of an imaginary line that is perpendicular to the plane's longitudinal axis and which passes slightly to the rear of the C.G. Guide loops positioned this way cause the plane to nose outward while it circles and in this way keep the lines taut. If the model noses outward too much, the inner wing swings forward and with it the guide loops. The effective pull of the line on the wing loops then comes *forward* of the C.G. and noses the plane *inward* again to a normal course. If the nose swings inward during flight, the effective pull of the lines moves to the *rear* of the C.G. because the wing swings rearward. This noses the plane *outward* again. Thus it is the forward or rearward position of these loops relative to the center of gravity that causes a plane to nose inward or outward and not necessarily the position of the bell crank. The bell crank may be placed anywhere within reason in the fuselage, provided the line guide loops on the wing are located properly.

Mr. Rowe says his other problem concerns the position of the wing relative to the thrust line. Should it be on the thrust line above it or below it? It is a notable fact that planes usually are faster when the wing is slightly below the thrust line. For instance, low wing model planes are faster than high or parasol wing models, both having the same power. The latter however, though they are smaller, have greater climb. For speed models, we suggest that you place the wing so the thrust line just clears its upper surface. The low wing position lowers the center of resistance and causes the airplane to aline itself in flight so the combination of wing and stabilizer passes through the air at the angle of minimum drag.

We have had letters from a number of readers, one from Louis Pess of Brooklyn, requesting information about the proportions of a model. Following is an outline of the proportions of a plane that will give good results for nearly every type of model, even though best results are obtained in some cases by a slight modification of these relationships. In any event, if your plane is designed as indicated here it will be stable, regardless of type.

1. When laying out your ship, start with the desired wingspan. 2. Establish the chord which should be about 1/8 the span and sometimes 1/10 for high efficiency. 3. Calculate the area of your wing accurately by multiplying the overall span by the average chord. 4. Locate the center of your stabilizer back of the wing, a distance equal to 4 times the wing chord. 5. Make the stabilizer area equal to 1/3 of the wing area. 6. The span of the stabilizer should be 4 times the stabilizer chord. 7. Distance from the center of the wing to the rear face of the propeller hub should be not greater than twice the wing chord. The shorter this distance is, the more stable your model will be longitudinally. 8. Set the wing at an angle of 3° relative to thrustline (except for low wing planes). This is the angle of incidence. 9. Set the stabilizer at an angle that is 2-1/2° less than the wing setting. 10. Locate the center of the wing a distance above the thrustline equal approximately to 1/2 the wing chord. 11. The propeller diameter for rubber models should be not less than 1/3 the wingspan. In gas models the diameter depends on the power of the engine for any given pitch and blade area. 12. The fin area, when located a distance behind the wing equal to 4 times the wing chord, should not be less than 10% of the wing area for rubber models and approximately 7% for gas models. 13. The wing should have a dihedral angle of 9° to 10°. This is obtained by raising each wingtip above the highest camber point of the wing center-section, a distance equal to 1 inch for every foot of wingspan. If the span is 3 feet, each wing tip should be raised 3 inches.

If you apply these proportions to your next airplane it will be sufficiently stable.

* *

Don't forget to submit your model aviation problems and ideas for your dream ship for publication in Design Forum. Address correspondence to De-

sign Forum, c/o Air Age, 551 Fifth Avenue, New York 17, N. Y.

(Note: We have received many questions for which lack of space makes adequate answer impossible. We note, however, that many are questions which are answered precisely and at great length in the model airplane textbook entitled "Model Airplane Design and Theory of Flight," by Charles Hampson Grant. We hope that you will obtain a copy of this book if you do not have one at present. Nearly every possible question on model aeronautics is answered in its 520 pages and profuse illustrations.)

Report From the West

(*Continued from page 9*)

ment figure. Well, it's here now, so we will get along with our story.

Although Mel is better known for his designing of the *Cyclone* and *Spitfire* engines, he has also achieved a number of notable "firsts" in the engine manufacturing field. For a person who started designing engines as a hobby he has come a long way.

During the war Mel worked with Ray Poquette, co-owner of one of the finest machine shops on the West Coast. Immediately following the war, Mel, Poquette and A. O. Samons formed the Mel Anderson Manufacturing Company.

After the forming of this company he promptly began on *Spitfire*. Many of the complex toolings were solved by Ace Boultinghouse. Ace is his right-hand man and is really an ACE when it comes to tooling. Like Mel he too is a modeler. A lot of credit goes to him for his work on the *Spitfire*.

Mel has had lots of experience in engine design and production work, and we look forward to more of his intriguing designs in the future.

* *

From Northern California we have a complete report of the 7th Annual Indoor Model Aircraft Contest—thanks to Mom Robbers. Held Sunday, March 20, the meet was sponsored by the *San Francisco Vultures* and the San Francisco Mutual Businessmen's Club. There were some startling results in the indoor events by newcomers from the CONTROLINE CLUBS. Forced indoors by the rainy weather, they decided to try their hand at building "this indoor stuff," and they are very enthusiastic about it.

All the Hand Launch Glider Jr. entrants in the winning circle were from the *S. F. Vultures* and they placed as follows: Jack Ritner :43.8; Dick Czeikowitz :43.0; Jim Bartram :40.0; Daryl Larks :32.6; Billy Bastida :29.4. In the Sr. division, Angelo Lo Castro, of the *Vultures*, took 1st place and possibly set a new AMA record with a class "B" flight of 1:03.8. Earlier in the day, Einar Enevoldson, also of the *Vultures*, had flown his Class A for a beautiful flight of 1:01.0 to give the Seniors something to shoot at. Einar came in 2nd in Sr. Glider and is applying for an AMA record. 3rd place was taken by Don Robbers of the *Oakland Cloud Dusters* with a time of :58.8 (too much basketball was his alibi); 4th place went to Eddie May of the *Vultures* with a flight of :52.0; and 5th place was taken by Charles Hallum of the *Alameda Aero Modelers* (strictly a CONTROLINE CLUB) with a time of :42.8.

The Open division was almost a walkaway for the *Cloud Dusters* with 1st place being taken by Michael Demos with 1:09.8; then Manual Andrade with 1:08.0; and Joe Bilgri with 1:01.0; Robert Moncrieff of the *Dusters* came in 4th with :55.0, and Bob Risvold of the *Vultures* took 5th place with :50.2. Carl (The Arm) Rambo made the classical statement of the meet when he said, "For your information, I entered the glider event."

Next, the glider enthusiasts were replaced by the scale-model-bugs who gave the judges their yearly headache to trying to choose a winner, with Carl Rambo, of the *Dusters*, and John Tatone, of the *Vultures*, both entered. The final decision was a tie for Open 1st place between Carl's Curtis *Robin* and John's *Spitfire*.

Jack Haines won L.A. Sport Contest with this 5-year-old plane

John had more building points and Carl had more flying points. Charles Pottol, of the *Dusters,* took 2nd place and Andrew Tiagliafico of the *Vultures* took 3rd place.

Senior division of flying scale was won by Eddie May, of the *Vultures,* and Daryl Larks won the Junior Event.

Then the floor was cleared for the microfilm models. The Jr. division was won by Ronald Atwood, *L. A. San Valeers,* with a flight of 8:14.4 (you should have seen Bill Atwood beaming); 2nd place went to Gorden Deneen, of the *Vultures,* with a 7:33.0; and Daryl Larks, of the *Vultures,* took 3rd with 6:36.0.

In the Senior Division, Eddie May got away to a nice flight of 10:03 to take first; Frank Devlin, of the *Vultures,* did 5:52 for 2nd; then of all things, Don Hollfelder, a precision flier from the *Alameda Aero Modelers,* took 3rd with a *Featherette* flight of 2:15.6; Charles Hallum, a speed flier from the same controline club, took 4th with a flight of 1:36. He came running over and made his official after a 5-minute test flight, he told Pop Robbers.

The Open division fliers gave the spectators and modelers the thrill of witnessing a spectacular flight by Carl Rambo of the *Dusters* with a time of 22:57.2 to take first place. Bill Atwood, of the *L. A. San Valeers,* was second with 19:03.4. Joe Bilgri was third with a 16:16.6 flight which left his ship hanging in the Cow Palace rafters. Warren Williams took fourth with 13:46. Michael Demos was fifth with 10:32 and Mom Robbers was given a special award for her sixth place flight of 9:56.2.

Although they did not place in the winning circle, a lot of the controliners and free flight boys are hollering for another indoor contest. There were a lot of beginners with hand launch gliders trying their arms out—or should we say, wearing their arms out! Wonder if we'll see Bill Atwood and Mike Demos flying controliners next?

Contest Directors Richard Brikett and Edward Bernardo; recorders Mr. and Mrs. Larry Kramer; timers Bert Walker, Mr. and Mrs. Harvey Robbers, and Charles Dorsett; and, of course, their cute li'l registrar Dan (The Pipe) Raymond, all worked together with the representatives of the San Francisco Businessmen's Club to make this another successful indoor contest.

Watch for us in the July issue.

SCRAP BOX

(Continued from page 5)

American weight lifting event, the baby engines, and so on.

While no harm possibly could be done by the inclusion of the Walker Flight Plan event in the Nationals—after all don't we have the Pan American event, and doesn't team racing deserve a break?—we should consider what we want the Nationals to be. If this crop of ideas continues to expand, it is possible that the Nationals would become a kind of carnival, defeating its own purpose, which is to determine the best fliers in the country with various basic types of airplanes. Perhaps new ideas should be tried on a national scale, waiting until so many localities schedule such events that it is perfectly obvious the idea has become the will of the crowd. Then, include the idea in the bigger sectional, regional, and national contests. Would it be advisable to get a solid season's experience with any new event under our belts before plugging it at the Nationals? This problem may be appreciated by Pan American who has scheduled their weight lifting event in 17 major cities.

Caught squarely in the middle of the battle between modelers who feel that engines must be souped-up to win contests and at least one manufacturer who states it isn't so, we offer this information from McCoy. Discussing the problem with us at the Toy Fair in New York, Charlie Miller, of McCoy, not only said that it is unnecessary to soup-up McCoys, but that home attempts to make engines run faster usually ruin the engine for peak performance. McCoy has a practice of obtaining record engines for testing and checking at the plant. Almost always the alterations are of dubious value. One record holding engine actually came in at 2000 rpm less than stock models. But, while most engines are sadly messed up by home workshop mechanics, an occasional feature is found valuable and this is incorporated into future engines. Sometimes, the information is important enough to announce.

One such feature was the oversized venturi, which now is general knowledge. Another was the slanted-end exhaust stack. When this improvement was found to boost rpm, the news was broadcasted by the manufacturer. Hot fliers on the coast who presumably had hit the top were able to pick up another 10 mph. By and large, however, it is a rare thing to find a worthwhile feature in the many alterations tried. In the case of the slanted-end exhaust, the engine involved had been radically reworked in stroke, etc., but the manufacturer discounted the value of these changes. McCoy insists that it is better to leave the innards of their engines alone. And, speaking of engines, we tried the new *Ohlsson 29* recently and it clocked 15,000 rpm on the *Strobotac* with a commercial hot fuel. We are also breaking in a *Mohawk* which makes a right devilish racket.

But enough of this weighty stuff. For the lighter side of modeling life, there's a cute story from Harry Geyer, the fellow who manufactures the Good Brothers Radio control equipment.

"At a local radio contest last year," recounts Harry, "an old fellow got deeply interested watching one entrant tinker with his ship. 'Say, son,' said the old gasser, 'they tell me you have a radio in there.' To which, the modeler, deeply absorbed in tuning his radio, replied, 'Yeah.' Quick as a flash the old fellow came right back. 'Well turn it on and let's hear some music.' "

A free one-year subscription for MODEL AIRPLANE NEWS to the man from Pittsburgh for the best tall but true story of the month.

New Approach to Stability

Though most modelers are unaware of it, a vast fund of information gained from experiments on flying models has been gathered by the N.A.C.A. experts. Facts on longitudinal stability, condensed from N.A.C.A. data will be presented in our July issue. Does that new original design of yours wander all over the sky? Read the solution in July M.A.N.!

Rudder Bug

(*Continued from page* 16)

for 3/4 speed. While the launcher holds the model ready for hand launching, the operator runs the rudder to Neutral to Left to Neutral. This leaves the rudder in Neutral going Right. O.K., let 'er go! Restrain that temptation and get altitude, at least 50'. Give short Right followed by Neutral. Then short Left and again Neutral. The purpose is to "feel out" the control sensitivity. Be cautious! Use the early flights to trim the rudder for straight flight in the glide, then trim for straight flight under power and finally for equal sized circles. Don't adjust the rudder for tight circles until you have a little practice under your belt. At first you may find it difficult to land into the wind and at a designated spot simultaneously, so concentrate on keeping it into the wind and someplace on the field, it's safer. Spot landings come with practice; a square approach pattern may help. ROG flights can be made when you have a good "feel" of the controls. Use full engine power and be ready to quickly correct any deviation. True running wheels are a necessity. The rudder becomes effective about 20' from release and 50' to 100' are required for take-off. Maneuvering near the ground is risky but fun—get plenty of practice before you try it.

When using tighter circles, the model will spiral down quite rapidly so go easy at first. To get a 360° turn requires rudder for about 270°, then neutralize—the model will coast the other 90°. This action is symmetrical either to the left or right. The glide circles will be larger than the power ones and the ship will enter the turn rather slowly, so allow for this when flying.

So happy spot landings and remember there is no substitute for plenty of flying practice!

(Note: Readers interested in RC should study the article by Walter and Bill Good in the March '48 issue of MAN for further information on flying and stunting a model with only rudder control.—Editor)

Flash

(*Continued from page* 6)

the Navy will beat with its swept-wing Vought XF7U. When this happens Air Force will be forced either to publish the actual X-1 speed or conduct a public timed test of the X-1. But the Navy has its Douglas *Skyrocket* held ready as its "Sunday Punch" in this inter-service race for the record and few engineers doubt that the gleaming white supersonic research plane can hit upwards of 1500 mph whenever it is called upon to do so. The D-558-II has the same rocket engine as the X-1 PLUS a Westinghouse 24C turbojet engine for take-off and landing and, additionally, has a swept, low-aspect-ratio wing and a much "cleaner" fuselage form. Thus, it incorporates not one but ALL of the supersonic speed requirements. But Air Force is quietly (but impatiently!) awaiting delivery of its new Bell X-1A fitted with a turbine pump, which will raise its speed to some 1800 mph and the Bell X-2, which will go on up into the 2000 mph bracket!

NOT SO exciting is the news about the little McDonnell XF-85 parasite fighter, which has been abandoned by the Air Force, as most engineers long predicted. Reason for the move is a combination of the fact that the tricky little airplane has proved just too much for the average pilot to handle plus the fact that the idea never was much good anyway! So tiny that its short length virtually prohibited the attainment of any stability, the mighty midget has a phenomenal top speed of more than

600 mph in straight flight. But its small size (determined by a B-36 bomb-bay) prevented its carrying much fuel (about 30 minutes' worth), or armament, or equipment. Overpowering factor, however, was the impracticality of operating such a systemtactically, since after launching the pilot was faced with the problem of staying within sight of its "mother" plane and, more importantly, of praying that its aerial hanger was not shot down, leaving the waif homeless over enemy territory! Two XF-85's were built and both are now at Muroc Air Force Base, Calif., but at least one of them has been doing duty as a theater lobby display for the picture "Command Decision," an ignominious end for what once was a top secret idea!

NEWS OF THE *Cutlass* this month, in addition to its scheduled assault on the world's speed record, includes the loss of the No. 3 prototype airplane in Chesapeake Bay under mysterious circumstances. The airplane took off on a routine test flight and was accompanied by a North American SNJ trainer mounting a camera in its rear pit. After "posing" for aerial photographs, test pilot William H. B. Millar nosed the swept-wing speedster up into a cloud at about 7000 ft. and was never seen again. A few days later parts of the airplane were seen floating in the Bay but nothing to indicate the cause of the accident. Meanwhile, the first two XF7U-1 fighters have been flown to the new Chance Vought plant near Dallas, Texas, where the production quantity of 30 airplanes is to be manufactured. Actually, the runway at the new Vought plant proved too short and the two Navy blue fighters are being tested from Carswell Air Force Base, Fort Worth, Texas, home of the 8th Air Force and the B-36 bombers, about 20 mi. away.

AIR FORCE has finally decided to end the long reign of kerosene as the standard jet engine fuel in favor of low-octane gasoline. The decision took a long time because kerosene is both cheaper and better, having a greater heating energy than gasoline. But kerosene is getting increasingly hard to get and the Air Force still needs far more gasoline than kerosene for its fleet of reciprocating aircraft. The new jet fuel will actually be only a low-octane of about 55-60 instead of the 100 and 130 octane used in high-compression reciprocating engines. Navy has always used gasoline in its jet fighters to simplify the fuel stowage problem on the carriers.

NO HUMAN HANDS touched the fuel lines throughout the four mid-air refuelings of the Boeing B-50 on its record-breaking 23,452-mile round-the-world nonstop flight, believe it or not! While mid-air refueling in the 'thirties required a crewman to stand erect out in the breeze and grasp at a dangling hose, the modern technique is fully automatic. When the B-50 reached its refueling rendezvous, it trailed a line reeled out of the tail by a cockpit control. The B-29 refueling plane then came alongside and fired a line across in front of the B-50 line, which slid down until hooks on the ends of both line engaged. Then the B-50 pilot flipped a switch which reeled in on this line. The other end of the B-29 line was attached to the fuel hose, which paid out until it was drawn into the nozzle of the B-50 in the tail, where it was automatically clamped in place. After about 10,000 gals. of fuel had been transferred, the pilot flipped a switch and the hose was freed as the B-50 continued on its way, with no crewmember actually having done anything in the process except watch the proceedings from a sighting station!

EVER STAY AWAKE for 36 hours? Ever stay awake for 36 hours while busy doing something? Ever stay awake for 36 hours while flying an airplane? Well, Bill Odom did and covered more than 5,000 miles in a Beech Bonanza while doing it! Odom made good after covering only 2400 miles on his first attempt last January. This time he completed the Honolulu-New York flight without incident, stepping from his cabin in a fresh business suit and cleanly shaven! Taking off with a mere 288 gals. of fuel, he had 14 gals. left when he landed at Teterboro, N.J., which means he averaged around 17½ miles to the gallon on the flight, which is just about what you get in your car!

THE BIG BOEING 377 Stratocruiser now going into trans-Pacific service for Pan American Airways is one of the world's most luxurious airliners with a fully-equipped bar and lounge, huge, comfortable seats, etc. But did you know that PAA is giving serious attention to turning the monster airliner into a "skycoach" seating 114 passengers! PAA now charges $630 round trip from New York to London for first-class luxury service but by cutting down the "tone" of the trip and carrying 114 passengers, PAA can offer a round-trip ticket for only $405, which would interest a lot more people. The tremendous success of skycoach service (which dispenses with meals aloft and other niceties) on several domestic airlines, has proved that the flying public wants such service and PAA, for one, is willing to prove it on trans-ocean flights. But imagine seeing an airplane pull up to a stop at Heathrow Airport, London, and 114 people file out!

LATEST ROCKET fighter to join the Air Force stable is the Republic XF-91, which is powered by both a conventional turbojet engine plus four rocket motors mounted in the tail. But what makes this new design unique is the fact that Republic engineers have turned the wing around, so to speak, so that it is now wider at the tips than it is at the roots! Yes, unlike the conventionally tapered wing, which thins out towards the tips, the XF-91 wing has "inverse taper," which is designed to shift the lift distribution inboard and thus preserve aileron control at the stall. Wing sweep has wreaked havoc with "hot" fighter planes at low speeds and this new trick is designed to cure this instability of the swept wing at slow speeds, such as during landing. The XF-91 also features bicycle arrangement of the dual wheels in each main landing gear which folds outboard into the wing tips! Republic used this arrangement to facilitate the use of wheels thin enough to fit into the super-thin wings now coming into use and, also, to spread the weight of the sonic-speed fighter more evenly over the runway. The plane was shipped to Muroc Air Force Base, Calif., in a transport, thus joining with its older brother the F-84 *Thunderjet* in becoming one of the few planes that made their "first flight" without a pilot at the controls!

NORTH AMERICAN has completed the first production model AJ-1 tri-motored Navy attack plane, which is scheduled to enter squadron service at nearby San Diego, Calif. The huge craft is powered by two Pratt & Whitney Wasp Major reciprocating engines plus a turbojet engine mounted in the tail. One of the prototype aircraft was lost in the Pacific Ocean recently, including two crew members, but the cause has not yet been determined. A total of 28 of the type is on order for service test. It will be the heaviest plane ever to operate regularly from a carrier.

LANDGRAF HELICOPTER Co. has given up the battle and sold its equipment at auction, including its racy-looking prototype, which went for a mere $50. One of the most promising of the postwar designs, the Landgraf was beset by many troubles that finally ended in a crash that virtually washed out the airplane, thus the low disposal price of the remains. Landgraf insists that its company is still in existence and that it has simply ceased active operations, but whatever the exact status, we hate to see this good-looking design fail to materialize.

FAIRCHILD AIRCRAFT has won that much-discussed trainer competition, just as everybody thought they would. The new T-31 is actually only the Navy XNQ-1 with slight changes for Air Force use. A total of 100 will be built at a cost of more than $8,000,000 with first deliveries from Hagerstown, Md., expected late this fall. Air Force had held up announcement of the contract until the new Beech 45 and Temco trainers could be tested, but these were only modifications of personal aircraft whereas the XNQ (or T-31) is a designed-for-the-purpose primary trainer. (See July '49 issue for T-31 details.)

Present Day Motors

(*Continued from page* 17)

cycle, a larger bypass, a new carburetor and crankcase back cover, and a flyweight piston. The cylinder liner, which contains three intake ports, is removed from the standard cylinder by warming it over a gas flame. By the use of a drill and file two more intake ports are added and the tops of all these ports are raised 1/64". The liner is then installed in the new aluminum cylinder component, which has a larger bypass, by heating the cylinder casting until the liner will drop in place. The rotary valve is removed from the standard back cover and the bridge over the intake port filed away. It is then installed in the new back cover with a .001-inch steel spacer between rotor and cover. Attached to the conversion back cover is the special turned aluminum carburetor. The lightweight piston, back cover assembly, and cylinder then are installed, an extra gasket being used under the cylinder so that the piston is flush with the bottom of the exhaust ports when it is at the bottom of the stroke. When the manufacturer installs the conversion equipment, a horsepower check is made at time of run-in.

In preliminary tests of a converted *Hornet* engine that had not been run in, a speed of 19,075 rpm was obtained with an 8" diameter, 5" pitch aluminum propeller, a methanol-castor fuel mixture, and spark ignition. Engine speed was tested with a Strobotac. Tests with larger propellers have not yet been carried out, but there is every indication that the *Hornet* conversion equipment makes possible the high output claimed by the manufacturer. To obtain maximum output from the *Hornet*, it is recommended that the operator use 2 parts methanol, 1 part castor oil, add 15% nitro-methane by volume, and work up to a maximum of 25% nitro-methane.

Following the introduction of the *Fox 59 High-Torque* engine, described in a previous article, the Claude C. Slate Co. brought out the *Fox High-Speed* racing engine of the same piston displacement. The latter is equipped with a two-ring piston die cast from aluminum alloy, and has a very high maximum power output. As this engine also has the exceptionally low weight of 9-1/4 oz., the power-to-weight ratio is high, which is an advantageous characteristic for model planes. Recently announced are two additional engines, the *Fox 49 High-Torque*, and the *Fox 49 High-Speed*. These engines are similar in general design to the larger engines, but have 1/8" less stroke. The *49 High Torque* has a steel piston, and the *49 High-Speed*, an aluminum alloy piston with rings. All Fox engines have rotory valves of the disk type, and the timer together with the spark advance lever are located at the rear of the cylinder for convenient control. Alcohol base fuels for Fox engines should consist of 2 parts castor oil and 5 parts alcohol. It is stated that fuels containing moderate quantities of nitro-methane, nitro-propane, or nitro-ethane will give improved performance, but they must contain adequate lubricant.

The new *Forster 305* is built from the same parts as the well known *Forster 29* engine with the one exception of the piston and cylinder assembly, which is sufficiently oversize to give the displacement of 305 cu. in., just enough to bring it into Class C. All the latest Forster improvements, such as a ball bearing crankshaft, high compression cylinder head, new carburetor, new adjustable contact points,

See pages 43 & 44

TABLE 3. PULSE-JET ENGINE DATA

	Thrust, Lbs.	Cycles per Sec.	Overall Length, In.	Maximum Diameter, In.	Weight, Oz.	Fuel	Materials
Minijet	2+	210-230	28½	2	16	Gasoline	Venturi, Carburetor, Head and Shield, Die Cast Aluminum Alloy; Nose, Faring, Blade Keeper, and Body Assembly Nuts, Brass; Tail Pipe, Inconel.
Dyna-Jet	4.25	240-260	21¼	2½	..	Gasoline	Combustion Tube, Stainless Steel; Valve Head and Retainer, Heat Treated Aluminum Alloy; Metering Jet, Brass; Flowjector, Steel; Valve, Heat Treated Spring Steel.

and new oversize metal fuel tank, are incorporated in the 305. The manufacturer points out that for free flight, a modeler can build a Class B plane powered with the .29 cu. in. engine, and then merely by substituting the model 305, enter the same plane in Class C competition. Many modelers feel that small Class C planes have a faster climb and reach higher altitudes to catch the thermals. Also, small Class C planes are more quickly and more economically built, and transportation of a small plane to and from the flying field is easier. Forster Brothers have issued new brake horsepower curves of the Model 29, including a curve for glow-plug ignition using alcohol plus nitro-methane fuel; with this combination the output is .40 hp. at 13,400 rpm. With electric ignition and an alcohol-castor mixture, the output is .36 hp. at 12,200 rpm, and with the same ignition and gasoline-mineral oil fuel the output is .32 hp. at 11,600 rpm.

While on the subject of engine performance, ignition systems, and fuels, it may be mentioned that after extensive tests relative to the use of the glow-plug in the *Dooling* racing engine, Dooling Brothers find that on the bench or in a race car where sufficient batteries may be used to give a good strong spark, electric ignition is slightly superior to glow plug ignition when a given fuel is used. However, in a racing airplane the elimination of batteries, coil, condenser, etc., lightens the ship to such an extent that smaller guide lines may be used; if electric ignition is fitted, the batteries carried are usually too small to give a satisfactory spark at the plug, and in such cases glow-plug ignition probably is better.

Dooling tests indicated that with a 4 to 1 methanol-castor mixture the power output with glow-plug ignition is somewhat below the output with electric ignition unless the 3-volt starting battery is left connected to the glow plug while running (a practice which greatly shortens plug life) in which case the output is approximately 95% of that with spark ignition. With 2 parts castor oil, 3 parts methanol, and 3 parts nitro-methane, and electric ignition, a test propeller that held the engine to 15,600 rpm on the alcohol-castor mixture turned 17,100 rpm. With the same nitro fuel and glow-plug ignition, the performance was slightly lower, but considerably better than with electric ignition using alcohol fuel with no nitro-methane. For optimum performance when using the glow-plug and nitro-methane fuel a higher compression ratio is required, but the most advantageous ratio was found to be extremely critical.

It should be noted that nitro-methane is extremely hazardous from a fire standpoint, also that under no circumstances should anything but castor oil and alcohol be added to nitro-methane, because the addition of some chemicals makes it sensitive to detonation from shock from rough handling.

The Bluestreak, designed by Ira J. Hassad, is a new racing engine with a displacement of .65 cu. in. and a rated output of 1+ hp at 15,000 rpm. The cylinder is iron, centrifugally cast, and has a bore of .940" and a stroke of .934". Six screws attach the head and cylinder to the aluminum alloy crankcase, which is a permanent mold casting, as is the piston. The connecting rod is machined from 24S-T aluminum alloy bar stock. A hardened steel spinner is attached to the end of the chrome molybdenum crankshaft, which turns on two ball bearings. A shaft type rotary valve is used. The cylinder compression ratio is 11 to 1. The preferred fuel is a methanol-castor mixture.

In addition to the *Wasp Twin 60*, there is now a *Super Wasp Twin 65*, the increased displacement of the new model having been obtained by increasing the stroke from .702" to .750". The bore of both models is .740". The two engines are similar in design, but the larger develops .80 hp at 13,000 rpm, as compared with .50 hp at 9,000 rpm for the *Wasp Twin 60* and is designed for radial mounting. Both engines have shaft type rotary valves for admitting the gas mixture to the crankcase.

The piston displacement of the *Anderson Spitfire* has been increased from .604 to .647 cu. in. by making the stroke the same as the bore, that is, .937". The engine is offered with either a cast iron piston lapped to fit or with an aluminum alloy piston and rings. It will turn a 13" dia. 7" pitch prop 11,000 rpm.

Already an unusually high-speed racing engine, the speed of the *Bungay 600* has been increased by about 1,000 rpm by the provision of 50% greater cylinder inlet port area. Bungay Brothers have developed and now offer as extra equipment an automatic spark advance—a real innovation in model engine accessories. The spark advance is manually set at full retard before starting. After the engine starts, the spark is automatically advanced, and the operator may set the device for any degree of advance desired before the engine is started. An advantage of this invention is that after the operator has determined by trial the correct amount of spark advance, he may set the device so that the spark is automatically advanced to this optimum point after the engine starts running.

The carburetor of the *Elf Four* is now equipped with an air filter to prevent dust from being drawn into the engine. Except for size, it looks like the air cleaner on your automobile. I believe the *Elf Four* is the only model 4-cylinder engine in regular production. With its well-balanced reciprocating parts and double power impulses per revolution, it is smooth in operation and well suited for radio controlled planes. It may be operated on glow plugs and racing fuels. When run on gasoline, SAE No. 40 oil is used, which gives higher output because of less drag. Like other *Elf* models it has copper-aluminum cylinders, sand cast, and a special type of aluminum piston with no external wristpin holes. The controls are grouped behind and above the engine for effective cowling.

Designed by Bill Atwood, the new *Triumph* engine is offered in two displacements, .49 cu. in. and .51 cu. in., so that one airplane may be entered in two classes simply by changing engines. Both engines weigh 8-1/2 oz. and have the same mounting characteristics. The cylinder bores are .890" and .900" respectively, and the stroke is .790" for both engines. Die castings are used extensively in the construction. Bushings are employed at both ends of the connecting rod. The tubular steel wristpin is hardened and ground and supplied with dural pads to prevent scoring of the steel cylinder sleeve. The piston is a permanent mold casting. The crankshaft is machined from solid alloy steel, hardened and ground. A rotary valve is used and the intake has a new type of air induction chamber which is said to prevent air starvation at virtually all operating speeds. It is stated that *Triumph* engines are individually run in and the speed checked with a tachometer.

A needle roller bearing at the lower end of the connecting rod and a dual ball-bearing-supported crankshaft are features of the new *DeLong 30 Glow-Plug Special*. This engine is rated at .51 hp at 15,000 rpm and will turn a 7" dia., 10" pitch propeller at this speed. The steel disk rotary valve is micro-ground. The engine is designed to operate on a mixture of castor oil, methanol, and nitro-methane. Most of its other features are similar to the well known *DeLong 30* spark ignition engine.

Class A, B, C, and D models of the *Buzz* engine have been placed on the market by America's Hobby Center. Most of the components of these engines are pressure die castings of aluminum alloy; hence the engines are very light for their displacement. All models are designed for beam mounting.

The *Sportsman, Jr.* and *Sportsman, Sr.* engines, built by McCoy, are designed especially for glow-plug ignition. The former has a displacement of .344 cu. in., and the latter .547 cu. in. displacement. Many of the design features of the Sportsman models are similar to the McCoy engine, but the crankshaft main bearings have Oilite bronze bushings.

Features of the *Glo-Champ 29*, offered by the Mercury Model Airplane Co., include a steel cylinder, hand-lapped steel piston, one-piece crankshaft and aluminum alloy crankcase. It is a three-port engine and is rated at 1/5 hp. A timer is included as regular equipment so that spark ignition may be used when desired.

Madewell Products, Inc., reports that the *Madewell 49* is out of production but that a new model is being developed the specifications of which are not yet ready for release.

In the compression-ignition engine field, the *Micro-Diesel* is a comparatively recent offering. It is a Class A engine with manually adjustable compression. Many of the parts are machined from solid stock, this being true of the graphite steel cylinder, naval bronze connecting rod, and aluminum alloy cylinder head. The crankcase is sand cast from aluminum alloy. The cylinder head is threaded to the cylinder. A bronze-bushed crankshaft main bearing is employed. Because the connecting rod is bronze, no bearing bushings are required. A ball and socket joint is provided at the upper end of the rod. The engine will turn a 10" diameter, 4" pitch prop 6,800 rpm. It may be operated on special catalytic fuel or on 3 parts ether and 1 part SAE 20 oil. The bare engine weight is 5 oz.

The *Deezil* Class A engine has been placed on the market by the Gotham Hobby Co. It is a long-stroke engine, the bore being .473" and the stroke .707", which makes the stroke-bore ratio 1.50 to 1. The compression ratio is adjusted by means of a contra piston. To cool the steel cylinder, aluminum alloy fins are provided. A bronze connecting rod is used with ball and socket joint at the piston end. The piston is steel. Either an 8" diameter, 10" pitch prop or a 10" dia., 6" prop may be used. The engine runs at 8000 rpm and weighs 5 oz.

Improvements in the *Drone Diesel* include a ball bearing crankshaft, drop forged aluminum alloy connecting rod, bronze-bushed to reduce wear, and a one-piece cylinder and crankcase construction which reduces weight and increases strength. The crankcase design allows for either beam or radial mounting. To increase efficiency, the bypass and exhaust ports have been enlarged.

Another carbon dioxide engine, the *Buzz CO2*, is now available. It has a cylinder with a bore and stroke of 3/16"; the cylinder is machined from bronze and the connecting rod is also of this metal. The piston is machined from steel, using an aluminum alloy crankcase. The engine will turn a 5-1/2" dia., 3" pitch prop 6000 rpm. It weighs 5/8 oz., complete with rechargeable tank and connecting tube.

The thrust of the latest model of *Dyna-Jet* has been increased to 4-1/2 lb. This pulse-jet engine operates at 240 to 260 cycles per second.

Considering the table of spark-ignition and glow-plug engines, this year there are as many engines with aluminum alloy cylinders as with iron or steel cylinders, about forty of each. Nearly all the engines in this table have aluminum alloy crankcases, and most connecting rods are of the same material—about 68% of the engines have rotary valves.

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